Rutlish School

CURRICULUM MAP	
Subject	Physics
Head of Department	Helen Ryan

SCHOOL INTENT

Rutlish School: Curriculum Intent

Rutlish School provides a meaningful, broad and balanced curriculum which is accessible to all, as well as supports and challenges all students. Through all we do, we prepare students for opportunities, responsibilities and experiences later in life for them to be aware of their responsibilities and feel confident to participate and contribute to society. We aim to inspire, enable and facilitate lifelong learners that build on their individual strengths and capabilities and achieve their ambitions. We seek to support our students in becoming healthy, happy, successful modern people young adults, who are knowledgeable, kind, aware, confident, capable and skilful members of society.

The school aims to:

- ensure that the curriculum is designed for every student of every ability and every background to be supported in making the best possible progress and attainment from their starting point; all students can access the curriculum offer, with planning and teaching that support, stretch and challenge all learners across a full range of abilities, and making any reasonable adjustments required where particular needs are identified;
- provide a curriculum that is sequenced to build skills and knowledge throughout students' time at Rutlish School, to promote a deeper understanding of the world outside the classroom and equip them for their next steps in education, careers and in life;
- ensure that our curriculum offer support different educational and career pathways, including EBACC and vocational;
- ensure our curriculum consistently promotes high moral standards, social and self-awareness and allows students to formulate informed opinions on social issues such as, equality, diversity and inclusivity as well as the practical aspects of society;
- enrich the curriculum and provide opportunities for students to build cultural capital, enhance a wide range of skills and knowledge beyond requirements of the national curriculum, and personalise and apply learning in other contexts;
- provide students with the skills and knowledge necessary to becoming independent, analytical, critical, and innovative thinkers and encourage students' curiosity, creativity, self-expression, resilience, and confidence;

provide consistent opportunities for students to develop and enhance their reading skills, and support is provided to ensure all students are able to access he curriculum.

DEPARTMENT INTENT

The science curriculum at Rutlish school is designed to give students the substantive and disciplinary knowledge they need to understand the science they come across in the world around them and differentiate it from pseudoscience. We aim to address any misconceptions that students may hold prior to lessons.

We aim to prepare the students for their future lives by giving them the skills to apply their knowledge in unfamiliar situations and to undertake a STEM career if they so choose. We aim to give them an understanding of the range of STEM careers available to them.

We want to develop students who are analytical and open minded in their approach to new information, who understand the importance of taking an ethical approach to scientific decision making. We aim to strengthen our students as independent thinkers who understand the value of asking questions.

Through our curriculum we aim to challenge students' preconceptions about science and the world around them. We aim to develop the understanding that science is for everyone.

Our curriculum is designed to encourage students' curiosity about the world around them and to help them make informed decisions throughout their lives.

KEY STAGE 3 RATIONALE/ INTENT

Ensure that all students are equipped with the foundation (building blocks) for Science. To instil an appreciation for Science. Develop practical skills and ensure that all students are on the same level when completing the KS3 Science course.

KEY STAGE 4 RATIONALE/ INTENT

Aim to give students an understanding of the range of careers available to them. Ensure that they are literate in science and have the ability to apply knowledge and skills to the outside world. Climate change/vaccines etc. Ensure they have the technical language. Ensure they have the motor skills and background knowledge especially needed in KS5.

KEY STAGE 5 RATIONALE/ INTENT

Providing the substantive knowledge to access the undergraduate course at university. Disciplinary knowledge – research skills

Rutlish School

YEAR 7 (From Sept 2022)					
	Energy	**Electricity & Magnetism**	**Forces**	**Waves**	**Our Universe**
KNOWLEDGE	• Energy and food • Use of energy in the home and body • Energy transfers • Energy conservation • Energy resources • Thermal energy and changes of state	All students will learn about: • Circuit diagrams and symbols • Series and parallel circuits • Mains wiring • Energy transfers in electrical appliances • Magnetic poles Some students may also learn about: • Potential difference, current and resistance • Electric fields • Magnetic fields • AC and DC • The national grid	All students will learn about: • Types of force • Floating and sinking Most students will also learn about: • Contact and non-contact forces • Gravity and weight • Resultant forces • Spinning • Changing shape • Speed	All students will learn about: • Wave properties • Sound waves • Light waves Some students will also learn about: • Reflection, absorption and transmission • Coloured light • The wave equation	All students will learn about: • Our place in space • The scale of the universe Most students will also learn about: • The structure of the solar system • Seasons
KEY SKILLS	• Recording observations • Labelling bar charts • Making comparisons using data in a table • Using decimal form	• Drawing circuit diagrams • Constructing circuits • Draw tables of results • Use scientific models • Substitute into equations • Use ammeters and voltmeters • Interpret oscilloscope traces	• Drawing force diagrams • Identifying relevant variables • Drawing results tables • Calculating means • Identification of anomalies • Substitution into equations • Introducing the idea that equations can be rearranged • Measuring accurately	• Drawing tables • Drawing bar charts • Substitution into equations • SI units and prefixes	• SI units
HOW DO WE BUILD ON SKILLS AND KNOWLEDGE?	This topic acts as an introduction to KS3 Physics. Energy is the core theme underpinning other ideas in Physics. The topic is used as an opportunity to work out the prior knowledge and understanding of students in a new context by linking it to contexts they will have encountered before (e.g. energy in food, electricity bills)	Builds on ideas from the energy topic, investigating electrical energy in more detail. Builds on work carried out in Primary school and addresses misconceptions that may have arisen from this.	Building on ideas from primary schools regarding forces. Building on mathematical skills from previous units.	Building on ideas from primary schools regarding light and sound. Building on experimental skills from previous units. Builds on ideas about energy from earlier in the year.	Building on ideas from primary school regarding the structure of the universe. Work on seasons builds on ideas from the waves topic.
LINKS TO THE WORLD i.e. links to careers; equality; gender, class,	• Climate change and energy resources link to current affairs. • Link to PSHE/PE – energy content of food, energy expended in exercise • Link to maths – use of bar charts and decimal form	• Link to careers – reference to jobs as electrician, technician, construction management, electrical engineering. • Link to maths – use of equation	• Link to maths – calculating means, use of equations	• Link to careers – reference to job as a lighting technician. • Link to biology – structure of the eye	• Link to careers - astronomy

Rutlish School

ASSESSMENTS Summative and Formative as applicable	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. Transition test to assess students' prior ability and skills. **Summative:** End of unit test – PEQs.	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** Assessment at each grade	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** Assessment at each grade.	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** Assessment at each grade	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** Assessment at each grade
SPECIALIST VOCABULARY	Energy resource Non-renewable Renewable Fossil fuels Thermal Chemical Kinetic Gravitational potential Elastic potential Light Sound Electrical Dissipated Joules	Potential difference / voltage Resistance Electrical conductor Electrical insulator Negatively charged Positively charged Electrons Charged Series Parallel Field Amperes Volts Ohms Live Earth Neutral	Gravity Magnetism Friction Air Resistance Thrust Upthrust Normal contact force Tension Electrostatic force Buoyancy Mean Anomalous Newton Resultant Clockwise Anti-clockwise Equilibrium Pivot Speed	Vibration Volume Pitch Amplitude Wavelength Frequency Period Vacuum Absorption Echo Incident ray Reflected ray Normal Scattering Transparent Translucent Opaque Electromagnetic	Universe Solar system Milky way Planet Moon Satellite Light year

Rutlish School

YEAR 8 (From Sept 2023)					
	Energy	**Electricity & Magnetism**	**Forces**	**Waves**	**Our Universe**
KNOWLEDGE	All students will learn about: • Energy dissipation • Power • Choosing energy resources • Change of state • Heat transfers • Insulation Some students may also learn about: • Work done • Gravitational potential energy • Efficiency • Comparing energy resources • Density • Thermal conductivity	All students will learn about: • Potential difference, current and resistance • Electric fields • Magnetic fields • AC and DC • The national grid Some students may also learn about: • Circuit rules • Ohm's Law • Permanent and induced magnets • Electromagnets	All students will learn about: • Contact and non-contact forces • Gravity and weight • Resultant forces • Spinning • Changing shape • Speed Some students may also learn about: • The Earth's gravitational field • Acceleration • Stopping distance	All students will learn about: • Reflection, absorption and transmission • Coloured light • The wave equation Some students may also learn about: • The law of reflection • Seeing colour • The electromagnetic spectrum • Dangers of electromagnetic waves • Absorbing and emitting radiation • Speed of sound	All students will learn about: • The structure of the solar system • Seasons • Phases of the moon Some students may also learn about: • The structure of the atom. • Isotopes • Development of the atomic model
KEY SKILLS	• Use SI units and prefixes • Use and rearrange equations • Use scientific models • Explain the use of scientific models • Identify independent, dependent and control variables. • Write a risk assessment. • Draw and interpret line graphs.	• Use scientific models • Substitute into equations • Use ammeters and voltmeters • Interpret oscilloscope traces	• Identify independent, dependent and control variables. • Draw appropriate graphs • Identify patterns in data. • Rearrange and substitute into equations • SI units and prefixes • Calculate different types of average • Interpret motion graphs • Draw conclusions from data	• Identify the variables in an investigation • Draw tables of results • Draw appropriate graphs • Select and substitute into equations • Use SI units and prefixes • Calculate percentages • Write a method • Write a risk assessment • Calculate percentage difference	• Interpreting data in tables and graphs
HOW DO WE BUILD ON SKILLS AND KNOWLEDGE?	Builds on ideas from Y7 energy. Building on mathematical skills from previous units.	Building on ideas from Y7 electricity and magnetism topic and energy topic. Building on skills from previous units.	Building on ideas from Y7 forces and energy topics. Building on skills from previous units.	Building on ideas from Y7 waves and energy topics. Building on skills from previous units.	Building on ideas from Y7 Universe and electricity topics
LINKS TO THE WORLD i.e. links to careers; equality; gender, class,	• Link to SMSC – use of different energy resources. • Link to maths – use of graphs and equations.	• Link to careers – reference to jobs as electrician, technician, construction management, electrical engineering. • Link to maths – use of equation	• Link to SMSC – Stopping distance and its safety implicatiosn • Link to maths – calculating means, use of equations	• Link to PSHE – assessing risk to self. • Link to biology – absorption of light in photosynthesis. • Link to maths – calculating percentage, use of equations	• Link to careers - astronomy

Rutlish School

ASSESSMENTS **Summative and Formative as applicable**	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. Transition test to assess students' prior ability and skills. **Summative:** Assessment at each grade	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** Assessment at each grade	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** Assessment at each grade.	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** Assessment at each grade	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** Assessment at each grade
SPECIALIST VOCABULARY	Dissipate Power Reliable Model Conduction Convection Radiation Fluid Conductor Insulator Work done Efficiency Density Thermal Conductivity	Potential difference Ammeter Resistance Series Parallel Field Amperes Volts Ohms Live Earth Neutral Induced	Scalar Vector Mass Weight Work done Extension Moment Fluid Field Categoric variable Continuous variable Thinking distance Braking distance. Independent variable Dependent variable Control variables	Transmission Reflection Absorption Echo Normal Incident ray Reflected ray Angle of incidence Angle of reflection Law of reflection	Planet Star Waxing Waning Gibbous Crescent Atom Electron Proton Neutron

Rutlish School

YEAR 8 (Up to 2023)				
	Energy	**Electricity & Magnetism**	**Forces**	**Waves**
KNOWLEDGE	**UNIT OF WORK: Work; Heating and Cooling**	**UNIT OF WORK: Magnetism; Electromagnets**	**UNIT OF WORK: Trial of mastery approach to Physics**	**UNIT OF WORK: Wave effects; Wave properties**
	• Recall ideas from Y7 Energy • Doing work • Levers • Thermal energy • Conduction and insulation • Convection • Radiation	• Recall ideas from Y7 Electricity • Magnetism • The Earth as a magnet • Electromagnets and their uses	• Recall ideas from Y7 Forces • Speed • Drag • Scalars and Vectors • Weight and Mass • Work done • Springs • Moments • Pressure • Distance – time graphs	• Recall ideas from Y7 Waves • Using light waves • Using sound waves • Transverse and longitudinal waves • Properties of light and sound • Combining waves
KEY SKILLS	• Substitution into equations • Rearrangement of equations • Sketching graphs	• Interpretation of circuit diagrams • Prediction based on scientific understanding • Literacy – comprehension • Writing a method • Drawing line graphs • Writing conclusions	• Substitution into equations • Identifying variables • Drawing results tables • Drawing bar charts • Describing patterns in data • Calculating averages (mean, median & mode) • Identifying anomalies • Rearranging equations • Drawing line graphs	• Scientific explanations • Writing comparisons • Identification of variables • Drawing a table of results • Drawing bar charts • Writing conclusions
HOW DO WE BUILD ON SKILLS AND KNOWLEDGE?	First lesson recaps knowledge from year 7 Energy topic. End of unit assessment incorporates these ideas. Ideas around conduction and convection rely on understanding of particle model taught in Y7 Chemistry.	First lesson recaps knowledge from Y7 Electricity topic. End of unit assessment incorporates these ideas. Some knowledge of magnetism expected from primary school, initial discussions to ensure everyone has this background understanding.	First lesson recaps knowledge from Y7 Forces topic. End of unit assessment incorporates these ideas. Rehearsing practical skills from previous units. Ideas around pressure making use of the particle model taught in Y7 Chemistry.	First lesson recaps knowledge from Y7 waves. End of unit assessment incorporates these ideas. Rehearsing practical skills from previous units.
LINKS TO THE WORLD i.e. links to careers; equality: gender, class, ethnicity, etc.; different	Link to maths – use of equations		Link to maths – use of equations, graphs, means	

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ASSESSMENTS Summative and Formative as applicable	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** End of unit test – PEQs.	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** End of unit test – PEQs.	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** Graded tests	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** End of unit test – PEQs.
SPECIALIST VOCABULARY	Work Lever Displacement Deformation Conductor Insulator Temperature Thermal energy Conduction Convection Radiation	Magnetic force Permanent magnet Magnetic poles Electromagnet Solenoid Core	Equilibrium Deformation Linear relationship Newton Resultant Force Friction Tension Compression Contact force Fluid Pressure Upthrust Atmospheric pressure	Ultrasound Ultraviolet Microphone Loudspeaker Pressure waves Waves Transverse wave Transmission

Rutlish School

YEAR 9			
	Energy	**Heating**	**Forces**
KNOWLEDGE	**UNIT OF WORK: Energy, Forces**	**UNIT OF WORK: Energy, Particle model of matter**	**UNIT OF WORK: Forces**
	• Energy transfers • Efficiency • Power • Work done • Kinetic Energy • Gravitational Potential Energy • Elastic potential Energy	• Density • States of matter • Internal energy • Conduction • Specific Heat Capacity • Specific Latent Heat	• Speed • Drag • Scalars and vectors • Weight and mass • Work done • Springs • Moments • Pressure • Distance-time graphs • The Earth's gravitational field • Acceleration • Stopping distance
KEY SKILLS	• Selection of equations • Substitution into equations • Rearrangement of equations • Use of SI units	• Selection of equations • Substitution into equations • Rearrangement of equations • Use of SI units • Safe use of appropriate apparatus • Describing scientific processes. • Drawing graphs of results • Drawing conclusions • Identifying variables • Writing methods • Analysing data • Identifying anomalous results • Calculating gradients	• Selection of equations • Substitution into equations • Identify independent, dependent and control variables. • Drawing appropriate graphs of results • Identify patterns in data. • Rearrangement of equations • Use SI units • Calculate different types of average • Interpret motion graphs • Draw conclusions from data
HOW DO WE BUILD ON SKILLS AND KNOWLEDGE?	First lesson builds directly on the energy topics in Y7 and 8, reviewing knowledge from these areas. Continued rehearsal of mathematical skills developed in KS3.	This topic builds on the energy topic in Y8 and the particle model topic from Y7 Chemistry. It provides an opportunity for rehearsal and development of mathematical and practical skills developed in KS3	This topic builds on the forces topics in Y7 & 8. It provides an opportunity for rehearsal and development of mathematical and practical skills developed in KS3
LINKS TO THE WORLD	Link to Maths – Use of equations	Link to maths – Use of equations	Links to maths – Use of equations, trigonometry, graphical analysis

ASSESSMENTS Summative and Formative as applicable	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. Assessment of practical booklet. **Summative:** End of unit test – PEQs.	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. Assessment of practical booklet. **Summative:** End of unit test – PEQs.	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. Assessment of practical booklet. **Summative:** End of unit test – PEQs.
SPECIALIST VOCABULARY	Efficiency Power Work done Gravitational Potential Energy Kinetic Energy Elastic Potential Energy	Density Internal Energy System Conductor Insulator Specific heat capacity Specific latent heat	Equilibrium Extension Compression Speed Deceleration Anomalous result Scalar Vector Mass Weight Work done Moment Fluid Field Categoric variable. Continuous variable Thinking distance Braking distance Independent variable Dependent variable Control variables

Rutlish School

YEAR 10				
	Electricity	**Generating Electricity**	**Nuclear**	**Mechanics 2**
KNOWLEDGE	**UNIT OF WORK: Electricity**	**UNIT OF WORK: Electricity, Electromagnetism, Energy**	**UNIT OF WORK: Atomic Structure**	**UNIT OF WORK: Forces, Particle model of matter**
	• (Triple) Static electricity • Electric current • Potential difference • Ohm's law • Filament lamps & Diodes • I-V graphs • Thermistors & LDRs	• Electrical power • Magnetism • Electromagnets • Electric motors (H) • (Triple) Induction • Renewable and non-renewable electricity generation • The national grid • (Triple) Transformers • (Triple) Transformer efficiency • AC & DC • Wiring a plug	• Atomic structure • Development of the atomic model • Radioactivity • Alpha, beta and gamma radiation • Half life • Risk and precaution • Using radation • (Triple) Nuclear Fission • (Triple) Nuclear Fusion	• Terminal velocity • Elasticity • (Triple) Momentum • (Triple) Vehicle safety • (Triple) Moments • (Triple) Levers and gears • (Triple) Pressure in gasses • (Triple) Pressure in fluids
KEY SKILLS	• Use of appropriate apparatus • Use of circuit diagrams • Constructing circuits • Substitution into equations • Rearranging equations • Using models and analogies • Using SI prefixes • Drawing line graphs • Identifying relationships between variables • Identifying key variables • Improving accuracy of an experiment • Writing a method	• Substitution into equations • Rearranging equations • Drawing magnetic fields • Identifying key variables • Drawing tables of results • Drawing graphs	• Interpreting information from the periodic table • Writing nuclear decay equations • Understanding the processes by which scientific ideas are reviewed and updated over time. • Interpreting exponential decay graphs • Drawing graphs • Analysing risk	• Use of appropriate apparatus • Interpreting graphs • Identifying relationships between variables • Plotting graphs • Identifying improvements to an experiment • Calculating gradients • Calculating area • Substitution into equations • Rearranging equations
HOW DO WE BUILD ON SKILLS AND KNOWLEDGE?	This topic builds on the electricity topic in Y7. It uses experimental and mathematical skills that were developed from Y7-9.	This topic builds on the electricity and magnetism topic in Y8, the electricity topic at the start of Y10 and the energy topic in Y7. It uses experimental and mathematical skills that were developed from Y7-9.	This topic builds on ideas about the structure of the atom studied in Y9 Chemistry.	This topic builds on the Mechanics 1 and Heating topics from Y9. It uses experimental and mathematical skills that were developed from Y7-9.

LINKS TO THE WORLD i.e. links to careers; equality; gender, class, ethnicity, etc.; different	Link to maths – use of equations, graphs skills	Careers link – Careers in the energy sector Current affairs – Effects of different energy resources Link to maths – use of equations, graphs skills	Chemistry link – structure of an atom Current affairs link – renewable power SMSC link – ethics of nuclear weapons a possible discussion for triple students Careers link – Nuclear Physicist, Nuclear medicine technologist SMSC link – Evaluating the use of radiation in medicine – weighing up risk Link to maths – use of equations, graphs skills	SMSC link – Vehicle safety Link to maths – use of equations, graphs skills
ASSESSMENTS Summative and Formative as applicable	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. Assessment of practical booklet. **Summative:** End of unit test – PEQs	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** End of unit test – PEQs	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** End of unit test – PEQs	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. Assessment of practical booklet. **Summative:** End of unit test – PEQs
SPECIALIST VOCABULARY	Charge Negative Positive Static Friction Current Ampere Coulomb Potential difference /Voltage Volts Ohms Resistance Thermistor Light Dependent Resistor Diode	Permanent Magnet Polarity Repel Attract Induced magnet Electromagnet Magnetic field Magnetic flux density Solenoid Motor effect Induction Generator Transformer Primary coil Secondary coil Renewable Non-renewable Alternating current Direct current Earth wire Live wire Neutral wire National grid	Nucleus Nucleon Proton Neutron Electron Radioactive Isotope Ion Radiation Alpha Beta Gamma Activity Count-rate Penetration Ionisaton Half-life Exponential decay Contamination Irradiation Fission Fusion Chain reaction Control rod	Terminal velocity Elasticity Hooke's Law Extension Compression Brittle Elastic Plastic Momentum Moment Lever Gear Pressure Fluid Density

Rutlish School

YEAR 11			
	Space (Triple only)	**Waves**	**Revision**
KNOWLEDGE	**UNIT OF WORK: Space** • Life cycle of a star • Orbital motion • Red Shift • The Big Bang Theory	**UNIT OF WORK: Waves** • Types of waves • The wave equation • Sound • (Triple) Waves for detection • Refraction • Reflection • The electromagnetic spectrum • Uses of EM waves • (Triple) Converging lenses • (Triple) Diverging lenses • (Triple) Visible light • (Triple) Blackbody radiation	**UNIT OF WORK: Everything!** See all previous units
KEY SKILLS	• Writing explanations	• Use of appropriate apparatus • Drawing ray diagrams • Use of SI units & prefixes • Writing methods • Substituting into equations • Rearranging equations • Analysing results • Evaluating experiments • Interpreting oscilloscope traces • Tabulating data • Drawing graphs • Describing the relationships between variables	• Manipulating equations • Solving multi-step calculations • Graph skills • Identification of variables • Writing methods • Interpreting exam questions • Comparing • Evaluating • Application of knowledge to unfamiliar contexts
HOW DO WE BUILD ON	This topic builds on the space topic in Y8 Chemistry and the Forces topic in Y9	This topic builds on the waves topics in Y7 & 8. It uses experimental and mathematical skills that were developed from Y7-10	This unit draw together and reviews all previous units of work, developing the exams specific skills required for success at GCSE.
LINKS TO THE WORLD i.e. links to careers;	Careers link – Careers in Astronomy Diversity link – The work of Subrahmanyan Chandrasekhar, Katherine Johnson	Link to maths – use of equations, graphs skills	Link to maths – use of equations, graphs skills
ASSESSMENTS Summative and Formative as applicable	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. Assessment of practical booklet. **Summative:** End of unit test – PEQs	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. Assessment of practical booklet. **Summative:** End of unit test – PEQs	**Formative:** constant AFL using a range of techniques, including self and peer assessment, verbal feedback, questioning, quizzes and regular book marking with specific targets (EBI) every 6 lessons. **Summative:** GCSE exam

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SPECIALIST VOCABULARY	Star Planet Nebula Protostar Main Sequence Star Red Giant Red Supergiant Black Dawrf White Dwarf Neutron Star Black hole Supernova Vector Doppler effect Red shift Wavelength Blue Shift Big Bang Steady state theory Cosmic Microwave Background Radiation	Transverse Longitudinal Wavelength Amplitude Frequency Compression Rarefaction Period Ultrasound Echo Sonar P-waves S-Waves Seismic waves Refraction Incidence Normal Specular reflection Diffuse reflection Electromagnetic Spectrum Radio wave Microwave Infrared radiation Visible light Ultraviolet X-rays Gamma rays Excitation De-excitation Blackbody radiation Emit Absorption Transmission	Balance Calculate Choose Compare Complete Define Describe Design Determine Draw Estimate Evaluate Explain Give Identify Justify Label Measure Name Plan Plot Predict Show Sketch Suggest Use Write

Rutlish School

YEAR 12 – AS content						
	Mechanics	**Materials**	**Waves**	**Electricity**	**Particle Physics**	**Quantum Physics**
KNOWLEDGE	**UNIT OF WORK: Mechanics**	**UNIT OF WORK: Materials**	**UNIT OF WORK: Waves**	**UNIT OF WORK: Electricty**	**UNIT OF WORK: Particle Physics**	**UNIT OF WORK: Quantum Physics**
	• Vectors • Forces n equilibrium • Moments • Principle of moments • Velocity • Acceleration • Equations of motion • Projectile motion • Newton's Laws • Terminal velocity • Momentum • Impulse • Elastic and inelastic collisions • Work and power • Efficiency • Conservation of energy	• Density • Hooke's law, • Energy stored in a stretched spring • Stress and strain • Young modulud	• Wave properties • Polarisation • Refraction • Total Internal reflection • Superposition • Stationary waves • Double slit interference • Single slit diffraction • Diffraction gratings	• Current & potential difference • IV characteristics • Ohm's law • Resistivity • Thermistors • Superconductors • Series circuits • Parallel circuits • Electrical energy and power • Potential dividers • EMF & Internal resistance	• Specific charge • Nuclear forces • Radioactive decay • Photons • Antiparticles • Particle interactions • Classifying particles • Quarks • Strangeness • Conservation laws	• Photoelectric effect • Fluorescent tubes • Line spectra • Wave-particle duality
KEY SKILLS	• Trigonometry • Use Pythagoras' theorem • Gradients of tangents • Change the subject of an equation • Solve algebraic equations • pply the concepts underlying calculus • Plot two variables from experimental or other data • Estimate results • use appropriate apparatus • Solve problems set in practical contexts • Plot and interpret graphs • Present data in appropriate ways • Consider margins of error, accuracy and precision of data	• Recognise and make use of appropriate units in calculations • Estimate results • Translate information between graphical, numerical and algebraic forms • Calculate areas • Consider margins of error, accuracy and precision of data • Know and understand how to use a wide range of experimental and practical instruments	• Evaluate results and draw conclusions • Present data in appropriate ways • Identify variables • Apply scientific knowledge to practical contexts • Comment on experimental design • use appropriate apparatus • Plot two variables from experimental or other data • Determine the slope and intercept of a linear graph • Use trigonometry	• Plot two variables • Calculate areas • Use ratios, fractions and percentages • Translate information between graphical, numerical and algebraic forms • use appropriate apparatus • correctly construct circuits • design, construct and check circuits • Apply scientific knowledge to practical contexts • Present data in appropriate ways • Process and analyse data	• Apply scientific knowledge to practical contexts • use ICT such as computer modelling, or data logger with a variety of sensors • Recognise and use expressions in decimal and standard form • Use an appropriate number of significant figures •	• Substitute numerical values into algebraic equations • Recognise and make use of appropriate units in calculations • Use an appropriate number of significant figures • Apply scientific knowledge to practical contexts • Process and analyse data

Rutlish School

HOW DO WE BUILD ON SKILLS AND KNOWLEDGE?	Builds on KS4 Mechanics and Energy topics. Builds on GCSE maths skills	Builds on KS4 Heating topic and Y12 Mechanics topic Builds on GCSE maths skills	Builds on KS4 waves topic Builds on GCSE maths skills	Builds on KS4 electricity topic Builds on GCSE maths skills	Builds on KS4 nuclear Physics topic	Builds on KS4 nuclear Physics topic
LINKS TO THE WORLD i.e. links to careers; equality; gender, class.	Link to A-level maths Vehicle safety	Link to A-level maths Link to careers in Engineering Vehicle safety	Link to A-level maths	Link to A-level maths		
ASSESSMENTS Summative and Formative as applicable	PEQs End of Unit assessment	PEQs End of Unit assessment	PEQs End of Unit assessment	PEQs End of Unit assessment	PEQs End of Unit assessment	PEQs End of Unit assessment
SPECIALIST VOCABULARY	Scalars Vectors Resolution Equilibrium Moment Couple Moment of a couple Centre of mass Displacement Projectile Terminal speed Momentum Impulse Elastic collisions Inelastic collisions	Density Hooke's Law Elastic limit Spring constant Tensile strain Tensile stress Elastic strain energy Breaking stress Plastic behaviour Fracture Brittle Young modulus	Oscillation Phase difference Polarisation Stationary waves Harmonics Superposition Path difference Coherence Diffraction Interference Monochromatic Refractive index Snell's law Total internal reflection Cladding Material dispersion Modal dispersion Pulse broadening Absorption	Electric current Resistance Ohm's law Semiconductor diode Resistivity Thermistor Superconductor Critical temperature Potential divider Terminal PD EMF Internal resistance	Specific charge Strong nuclear force Neutrino Antiparticle Planck constant Annihilation Pair production Weak nuclear force Exchange particle Virtual photon W boson Hadron Baryon Meson Pion Kaon Lepton Muon Strangeness Quarks	Photoelectric effect Threshold frequency Work function Stopping potential Ionisation Excitation Fluorescent tube Electron volt Line spectra Electron diffraction Wave-particle duality De Broglie wavelength

Rutlish School

YEAR 12 – A level content				
	Further Mechanics	**Fields**	**Nuclear Physics**	**Thermal Physics**
KNOWLEDGE	**UNIT OF WORK:**	**UNIT OF WORK:**	**UNIT OF WORK:**	**UNIT OF WORK:**
	• Circular motion • Centripetal force and acceleration • Simple Harmonic Motion • Energy in SHM • Mass-spring systems • Pendulums • Damping • Resonance	• Newton's Law of Gravitation • Gravitational field strength • Gravitational potential • Satellites • Escape velocity • Coulomb's law • Electric field strength • Electrical potential • Comparing electric and gravitational fields	• Rutherford scattering • Alpha, beta and gamma radiation • Using radiation • Radioactive decay • Applications of decay • Nuclear stability • Nuclear radius • Mass and energy • Nuclear fusion • Nuclear fission • Nuclear reactors	• Internal energy • Specific heat capacity • Specific Latent heat • The Gas Laws • Ideal gasses • Brownian motion • Kinetic theory
KEY SKILLS	• Estimate results • Calculate gradients • Apply the concepts underlying calculus • Use of small angle approximations • use ICT • use methods to increase accuracy of measurements,	• Apply scientific knowledge to practical contexts • Present data in appropriate ways • use appropriate digital instruments • Estimate results • Apply the concepts underlying calculus • Use logarithmic plots • Use ratios, fractions and percentages • Substitute numerical values into algebraic equations using appropriate units for physical quantities	• Understand simple probability • Make order of magnitude calculations • Interpret logarithmic plots • Use logarithmic plots to test exponential and power law variations • Plot and interpret graphs • Process and analyse data	• Know and understand how to use a wide range of experimental and practical instruments • Evaluate results and draw conclusions • Solve problems set in practical contexts • use appropriate apparatus • Identify uncertainties in measurements • Determine the slope and intercept of a linear graph
HOW DO WE BUILD ON SKILLS …	Builds on Mechanics topics Builds on AS mathematical skills	Builds on Electricity, Mechanics and Further Mechanics topics Builds on AS mathematical skills	Builds on Particle Physics and Fields Builds on AS mathematical skills	Builds on GCSE Heating topic Builds on AS mathematical skills
LINK	Links to A-level maths	Links to A-level maths	Ethical approaches to Nuclear power generation Links to A-level maths	Links to A-level maths Links to A-level Chemistry
ASSESSMENTS Summative and Formative as applicable	PEQs End of unit assessment	PEQs End of unit assessment	PEQs End of unit assessment	PEQs End of unit assessment
SPECIALIST VOCABULARY	Centripetal force Angular speed Centripetal acceleration Simple harmonic motion Damping Free vibrations Forced vibrations Resonance	Inverse-square Field lines Potential Equipotential surface Field strength Orbital period Escape Velocity Synchronous orbit Geostationary orbit Coulomb's law Permittivity of free space	Rutherford scattering Inverse-square law Background radiation Activity Decay constant Half-life Mass difference Binding energy Thermal neutrons Moderator Control rods Coolant	Internal energy Specific heat capacity Specific latent heat Absolute zero Avogadro constant Ideal gas Molar mass Molecular mass Boyle's law Charles' Law Pressure law Brownian motion

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YEAR 13				
	Capacitors	**Electromagnetism**	**Astrophysics**	**Revision**
KNOWLEDGE	**UNIT OF WORK: Capacitors**	**UNIT OF WORK: Electromagnetism**	**UNIT OF WORK: Astrophysics**	**UNIT OF WORK: All previous units**
	• Capacitance • Energy stored by a capacitor • Charging and discharging capacitors	• Magnetic fields • F=BIl • F=Bqv • Flux and flux linkage • Faraday's Law • Lenz's law • Alternating currents • Using an oscilloscope • Transformers • Transformer efficiency	• Converging lenses • Refracting telescopes • Reflecting telescopes • Relative merits of different types of telescopes • CCDs • Classification by luminosity • Distances in space • Classification by absolute magnitude • Blackbody radiation • Spectral classes • Hertzsprung-Russell diagrams • Stellar Evolution • Supernovae, black holes and neutron stars • Doppler effect • Binary stars • Quasars • Detection of exoplanets	See all units Y12/13
KEY SKILLS	• Interpret logarithmic plots • correctly construct circuits • use ICT such as computer modelling • Apply scientific knowledge to practical contexts • Present data in appropriate ways • Evaluate results and draw conclusions with reference to measurement uncertainties and errors	• Use ratios, fractions and percentages • Calculate areas • use appropriate digital instruments • use signal generator and oscilloscope, including volts/division and time-base	• Drawing ray diagrams • Manipulating logs • Use of inverse square laws • Use of small angle approximations • Use of trigonometry	• Selecting relevant information to answer questions • Communicating information using appropriate scientific terminology • Applying scientific knowledge, principles in unfamiliar contexts • Giving well-structured and lucid answers • Carrying out complex multi-step calculations accurately • Linking information from different parts of the specification • Manipulating algebraic expressions fluently • Selecting evidence from a range of data to reach a conclusion • Analyse provided evidence • Interpret and evaluate ideas • Discussing changes to the behaviour of a system when its parameters change • Refining practical designs and procedures • Making observations and measurements with appropriate precision

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HOW DO WE BUILD ON SKILLS AND KNOWLEDGE?	Builds on Y12 Electricity, Electric fields Gives opportunity to rehearse mathematical and practical skills from previous units	Builds on Y12 Fields, Further mechanics, Electricity Gives opportunity to rehearse mathematical and practical skills from previous units	Builds on Y12 Waves, further mechanics & fields topics Builds on Y11 Waves and Space topics Gives opportunity to rehearse mathematical skills from previous units	Builds on all topics from Y12/13
LINKS TO THE WORLD i.e. links to	Maths link - logarithms		Diversity link – Chandrasekhar Maths links – Trig, logarithms Chemistry links – Spectral analysis	Links to maths
ASSESSMENTS Summative and Formative as applicable	PEQs End of unit assessment	PEQs End of unit assessment	PEQs End of unit assessment	Mock examinations, PEQs, Final A-level assessment
SPECIALIST VOCABULARY	Capacitance Dielectric Relative permittivity Polar molecule Time constant	Fleming's left hand rule Magnetic flux density Cyclotron Flux linkage Faraday's law Lenz's law Induction Sinusoidal Root mean square Peak-to-peak Oscilloscope Transformer Efficiency Eddy current Lamination	Focal point Refracting telescope Normal adjustment Cassegrain telescope Collecting power Resolution Chromatic aberration Spherical aberration Luminosity Absolute magnitude Apparent magnitude Parsec Light year Astronomical unit Blackbody radiation Hertzspung-Russell diagram Stellar classification Swartzchild Radius Red Shift Cosmological microwave background radiation Relative abundance Quasars Exoplanets Radial velocity Transit	Analyse Annotate Apply Calculate Comment Compare Complete Deduce Derive Describe Design Determine Discuss Distinguish Draw Evaluate Explain Identify List Measure Outline Predict Sketch Solve Suggest