Science Policy

Whitefriars School

Approved by:	**SLT**
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Intent

 Article 29: *Your right to become the best that you can be.*

The pupils will learn how scientific theories are continually modified to take account of new evidence and ideas. Pupils will grow to ask their own questions and develop a line of inquiry based on their own observations of the real world, which they will combine with their prior knowledge and experience. The pupils will learn to make their own predictions and carry out experiments to test these by identifying variables and selecting apparatus. They will learn to take measurements using the appropriate units and learn to use this data to formulate conclusions, whilst identifying the potential sources of error. They will learn to make use of a variety of scientific calculations.

The pupils will develop interest, enthusiasm and curiosity for Science. They will acquire an understanding of different scientific concepts and skills. They will become critical, logical and reflective thinkers with enquiring minds. The pupils will learn to ask relevant questions and be able to formulate well thought out answers based on scientific theory. The curriculum ensures that pupils will know and remember the key information studied.

Implementation

 Article 28: *Your right to learn and go to school.*

Skills and Content

 Article 3: *Everyone who works with children should always do what is best for each child.*

In the curriculum the pupils learn about a variety of scientific theories and concepts. The order of these topics and the structure of the curriculum has been designed to allow pupils to have a deeper understanding of the scientific principles being taught.

The pupils will learn a variety of scientific skills. These develop through the whole school, from the beginning of the primary section to the end of the secondary section. The part of the skill taught in each year group, and each phase of the school, is well-designed and based on the through-school approach. Secondary section teaching is fully integrated with and builds upon the development of skills in the primary section.

Our curriculum fully embraces and meets all the requirements of the National Curriculum and the Statutory Framework for the Early Years Foundation Stage, and enhances this according to the needs of our pupils. Regular planning sessions ensure coverage is thorough.

Timetable

In the primary section, pupils have bespoke Science lessons on a weekly basis. In Key Stage 3, pupils have three timetabled lessons per week in Years 7, 8 and 9. Science is

compulsory at KS4, and all pupils have five periods per week in Years 10 and 11.

Pupils can choose one or more of Biology, Chemistry and Physics to study at A-Level in the Sixth Form. Pupils receive five lessons per week in each science subject chosen.

EYFS

In EFYS, pupils explore the natural world around them, describing what they see, hear, and feel whilst outside. They discuss the effects of seasonal change on the natural world around them.

The Key Stage 1 curriculum builds on the skills and experiences in EYFS. Pupils learn about plants, animals, everyday materials, living things and their environments, and seasonal changes.

In Key Stage 2, pupils build on their learning about plants, animals, and habitats, and develop a foundational knowledge of physics, geology, chemistry, and evolution, and learn about Earth and Space. Each year the curriculum builds on prior learning to ensure a deeper understanding of each curriculum area.

The KS3 curriculum fully builds on the primary section curriculum and continues the systematic and sequential development of scientific ideas. In Year 7 pupils are taught about cells and body systems, the particle theory, forces, elements compounds and mixtures, sound, reproduction, the periodic table, and space. In Year 8 pupils are taught about health and lifestyle, chemical reactions, electricity and magnetism, adaptation and inheritance, metals acids and alkalis, energy, and light. In Year 9 pupils are taught about ecosystems and natural processes, materials and earth and separation techniques.

GCSE and A-Level

Science is a compulsory subject at GCSE level, in Years 10 and 11. Pupils can study combined science or single sciences. The combined sciences qualification has a foundation and higher tier of entry. Decisions concerning which pupil enters which course, and at what tiered level is based on assessment information to ensure that pupils study a course that directly meets their needs.

Pupils have the option of studying one or more of the Science specialisms at A Level. These are Biology, Chemistry and Physics.

The curriculum has been designed so that Science teaching at GCSE and A Level fully develops from that taught in the earlier key stages. As such pupils are fully prepared for this higher-level study.

Extra-Curricular

KS4 pupils have access to regular revision session clubs to consolidate content and skills in preparation for GCSE examinations.

All pupils have the opportunity to attend various trips to benefit from seeing the application of Science in the real world. These include to London Zoo, Science Museum and the BodyWorlds exhibition. This deepens knowledge and understanding.

Pupils also have numerous opportunities to participate in external events and workshops, including Salter's Festival of Chemistry, organised by Brunel University, and a STEM activity day, run by MSC Projects. This allows pupils to talk to employers from different fields of scientific work and get involved in the practical applications of Science within the various fields of work. There are regular Science and STEM clubs open to all pupils.

Implementation - Skills

	Use Scientific Vocabulary	Hypothesise	Perform Scientific Enquiries	Evaluate and Conclude
EYFS (Nursery)	Use appropriate vocabulary to explain what they see	Ask questions about what they see and feel	Use all senses to explore materials Observe differences, E.g. In settings, in materials	Realise that repeated actions have an effect Talk about what they see, hear and feel
EYFS (Reception)	Describing what they see, hear and feel	Ask questions to help them understand their world	Explore the natural world around them Observe, physically examine and listen carefully	Talk about changes they notice
Year 1	Define simple scientific language. E.g., Names of plants and animals, weather and seasons, measure, fair test, carnivores, herbivores and omnivores, everyday materials	Ask simple questions. E.g., How do plants change over the year? What is the best material for an umbrella? A spoon? Make a simple prediction about what will happen in an experiment.	Observe closely, using simple equipment. E.g., a magnifying glass Perform and observe simple tests. E.g., to find out if a material is waterproof. Identify and classify. E.g., types of trees Gather and record data. E.g. Measuring the distance travelled in a table.	Describe what happened during an experiment. Use their observations and ideas to suggest answers to questions. E.g., fabric would not be a good material for an umbrella because it is not waterproof. Recognise that questions can be answered in different ways. E.g., a written statement, a diagram, a simple chart
Year 2	Define further scientific language. E.g., habitats and micro-habitats, food chain, classify, physical, observe, record, compare, offspring, basic needs, survive			
Year 3	Define further scientific language. E.g., measurements using standard units, results, conclusions, observations, similarities, differences, nutrition, organic matter, rocks, reflected, light source, attract, repel, magnets	Ask questions that could be made into a hypothesis. E.g. What happens when we heat up a liquid? Make a prediction for an experiment based on scientific facts. E.g.	Explain why it is a fair test. Make systematic and careful observations and take accurate measurements using standard units. Use a range of equipment. E.g. thermometers and data loggers. Gather, record, classify and present data in a variety of ways to help answer questions. Identify differences, similarities or changes related to simple scientific ideas and processes.	Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions. Eg. using simplified drawings, labelled diagrams, keys, simple bar charts, and simplified tables Make scientific conclusions about the experiment. Suggest improvements for the experiment based on the quality of the data gained. Use the experiment conclusion to see if the prediction was correct. Use straightforward scientific evidence to decide if the conclusion was correct.
Year 4	Define further scientific language. E.g., environmental changes, digestive system, predators, prey, producers, solids, liquids, gases, evaporation, condensation, water cycle, vibrations, medium, volume, circuit, electricity, loop, switch, conductors, insulators			
Year 5	Use scientific language correctly in response to scientific questions. E.g., diagrams, classification keys, graphs, accuracy, precision, comparative and fair tests, conclusions, causal relationships, support, refute, reproduction, solubility, thermal and electrical conductivity, filtering, evaporating, dissolving, change of state, orbit, gravity, air resistance, gravity, hypothesis	Explain what a hypothesis is. Suggest a hypothesis in relation to the topic being studied that could be tested in an experiment Plan a simple experiment to test a hypothesis and ensure it is a fair test (by controlling variables where necessary).	Take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate. E.g. thermometers, etc. Understand what variables in an experiment are. Explain scientific evidence that has been used to support or refute ideas or arguments	Report and present findings from enquiries, including conclusions, causal relationships, and explanations of results, in oral and written forms such as displays and other presentations. E.g., using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs. Use test results to make predictions to set up further comparative and fair tests.
Year 6	Use further scientific language correctly in response to scientific questions. E.g., Circulatory system, nutrients, evolution and inheritance, adaptations, offspring, voltage, diagrams			
Year 7	Use scientific language to talk and, write about what has been observed in experiments. E.g. observations, data, Prediction, Hypothesis, Independent/ Dependent/ Controlled Variables, Analysis and Evaluation	Ask scientific enquiry questions E.g. What happens if I change the intensity of light a plant receives? What factors can affect the speed of a toy car travelling down a ramp? Write questions in the format 'How does... change over time?' Suggest a hypothesis and justify your hypothesis with scientific concepts. Devise a suitable plan to test the hypothesis. Predict what will happen if your hypothesis is correct.	Identify an observation that can be recorded or measured over time and select a suitable range of equipment to use. Explain the difference between dependent, independent and controlled variables. Identify a dependent variable. Identify an independent variable. Decide how to measure the dependent variable. Identify all the control variables which would need to be kept the same for the test to be fair. Write a question linking variables in the form 'How does... affect...?' Identify two variables which may show a correlation. Write a question in the form 'Is there a correlation between… and…' Identify features of an investigation which are hazardous. Identify ways of reducing the hazard. Use test results to make secondary predictions for comparative results to be collected. Follow a step-by-step method to conduct the experiment. Gather sufficient data for the investigation and repeat if appropriate. Make accurate measurements and include units. Prepare a table with space to record all measurements. Use scientific evidence to support the evidence/ data collected.	Decide the type of chart or graph to draw based on its purpose or type of data. Label the x axis with the name of the independent variable and the y axis with the dependent variable. Decide which numbers to start and finish with on each axis. Write unit labels on the axes. Mark out an equal scale showing what each square of graph paper represents. Draw a straight line or a curve of best fit through the points. Incorporate the pattern you found into an answer to the enquiry question. Record/present data and results of increasing complexity. E.g., using scientific diagrams scatter graphs, bar and line graphs State whether or not the hypothesis is correct. Make a detailed scientific conclusion and explain it with scientific reasoning for your findings. Decide whether the conclusion of the experiment agrees with your prediction. Judge whether the conclusion is supported by the data. Justify whether anomalous results can be explained or ignored. Suggest other possible conclusions that could be drawn from your data. Explain why an explanation is more believable when supported by data from an experiment. Identify further questions arising from the investigation.
Year 8	Use further science language when formulating answers to verbal and written questions/ explanations e.g. increasing, decreasing, plateau, elements, reactions, current, adaptation, force, photosynthesis Use relevant scientific language to explain why scientific processes occur. E.g., The rate of photosynthesis increases as the intensity of light increases, because if there is more light, more photosynthesis can take place			
Year 9	Use scientific language to explain theoretical concepts. E.g., Respiration, Immune Responses, Electricity, Current, Gravity, Energy Transfers, Displacement, Separation Techniques			
Year 10	Use relevant scientific language and illustrations to discuss, communicate and justify scientific ideas. E.g., Describe, Explain, Suggest, Predict, State, Analyse, Compare, Justify	Use scientific theories and explanations to develop a hypothesis and support it in detail. Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data and explore phenomena. Describe a practical procedure for a specified purpose. E.g. Investigating the effect of temperature on the rate of enzyme activity or Investigating the reactivity of group 1 elements with water, as we move down a group Explain why a given practical procedure is well designed for its specified purpose of testing a hypothesis. Comment on the extent to which collected data is consistent with a given hypothesis. Identify which of two or more hypotheses provides a better explanation of data in a given context.	Devise a suitable, relevant and precise method that can investigate a scientific question. Select a suitable range of equipment to use, with justifications of equipment choices in relation to precision and accuracy e.g. a syringe has smaller intervals than a measuring cylinder and therefore more accurate volumes of a liquid can be measured Identify the difference between qualitative and quantitative observations. Choose a suitable range for the independent and dependent variable. Identify the dependent and independent variables within the investigation and decide on a suitable range for the independent variable. Identify the most suitable method to make accurate measurements of the dependent variable. Apply a knowledge of a range of techniques, instruments, apparatus, and materials to select those appropriate to the experiment. Check that the measuring instrument can measure the complete range of the independent variable. Check you can detect differences in the dependent variable. Use the measuring instrument correctly.	Present data using bar chart, histogram, pie charts, diagrams. Plot two variables from experimental or other data. Recognise or describe patterns and trends in data presented in a variety of tabular, graphical and other forms. Draw conclusions from given observations. Decide whether the conclusion of the experiment agrees with your prediction. State whether or not the hypothesis is correct. Quote any secondary data you have which led to the same conclusion Evaluate methods and suggest possible improvements and further investigations e.g. repeating the experiment if anomalous data is collected, using more precise equipment, such as a syringe, with smaller graduations Apply ideas to evaluate data to suggest improvements to procedures and techniques. I.E. • An accurate measurement is one that is close to the true value. • Measurements are repeatable when repetition, under the same conditions by the same investigator, gives similar results.
Year 11	Use scientific ideas to explain processes. E.g., The rate of diffusion is dependent on the temperature of the solution, as particles move along the concentration gradient from an area of high concentration to low with more kinetic energy.			

			Select important control variables. Identify how to control each control variable. List variables you cannot control. Identify the main hazards in the practical and complete a risk assessment which identifies hazards and suggest precautions to reduce the risk of harm. Prepare a table, with column headings for the independent and dependent variables to record all measurements. Ensure the table includes repeats. Include units in the headings of the table. Carry out experiments appropriately having due regard for the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations. Make and record accurate measurements to the same significant figures. See if repeated measurements are close. Identify and remove outliers when calculating the mean of repeats. Use scientific evidence to justify the evidence/ data collected.	• Measurements are affected by random error due to results varying in unpredictable ways; these errors can be reduced by making more measurements and reporting a mean value. • Any anomalous values should be examined to try to identify the cause and, if a product of a poor measurement, ignored
Year 12 and 13	Use scientific ideas to explain and justify processes. "E.g., Adherence to a treatment for Type 2 diabetes is important to evaluate the clinical evolution of a pathology. Studies indicate that 50% of people with chronic diseases comply with their treatment."	Use scientific theories and explanations to support and test given hypothesis. Devise methods for experiments and choose suitable equipment to carry out practicals, make observations and test hypotheses. Carefully check and scrutinise data collected. Devise a suitable practical procedure to investigate a specified purpose. E.g. Investigating the effect of concentration on titrations Analyse and evaluate on the extent to which collected data is consistent with a given hypothesis. Compare which of two or more hypotheses provides a better explanation of data in a given context.	Design or choose the most suitable method to make accurate measurements of the dependent variable. Apply a knowledge of a range of techniques, instruments, apparatus, and materials to select those appropriate to the experiment. Compare equipment to choose the most suitable measuring instrument that can measure the complete range of the independent variable. Check you can detect differences in the dependent variable. Use the measuring instrument correctly. Select important control variables. Identify how to control each control variable. List variables you cannot control. Identify the main hazards in the practical and complete a risk assessment which identifies hazards and suggest precautions to reduce the risk of harm. Design a table, with column headings for the independent and dependent variables to record all measurements, with no guidance. Ensure the table includes repeats. Include units in the headings of the table using the correct units. Carry out experiments appropriately, following the risk assessment having due regard for the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations. Carefully record accurate measurements to the same significant figures. See if repeated measurements are close. Identify and remove outliers when calculating the mean of repeats. Use scientific evidence to justify the evidence/ data collected.	Construct an appropriate form of data representation i.e. using a bar chart, histogram, pie charts, diagrams. Plot two variables from experimental or other data. Describe patterns and trends in data presented in a variety of tabular, graphical and other forms. Draw valid conclusions from given observations. Decide and justify whether the conclusion of the experiment agrees with your prediction. State whether or not the hypothesis is correct. Quote any secondary data you have which led to the same conclusion Evaluate methods and suggest possible improvements and further investigations e.g. repeating the experiment if anomalous data is collected, using more precise equipment, such as a syringe, with smaller graduations Evaluate data to suggest improvements to procedures and techniques and consider how equipment can be changed to provide you with more concise data. I.E. • An accurate measurement is one that is close to the true value. • Measurements are repeatable when repetition, under the same conditions by the same investigator, gives similar results. • Measurements are affected by random error due to results varying in unpredictable ways; these errors can be reduced by making more measurements and reporting a mean value. • Any anomalous values should be examined to try to identify the cause and, if a product of a poor measurement, ignored

Implementation – Content

Article 13: *Your right to have information.*

	Half Term 1	Half Term 2	Half Term 3	Half Term 4	Half Term 5	Half Term 6
Nursery	What do I like in my environment?	How did we do that? What are senses? (Cause and effect / Exploring natural materials)		How can things help us? (Properties of materials)	How can we look after plants? How can we care for animals? (Planting and growing cycles / life cycle of caterpillars)	
Reception	What can happen in different seasons? (Observational changes and norms)		What makes the Earth special? (Observational changes of seasons/space/oceans)		How do plants and animals grow and change? (Life cycles)	What are healthy choices?
Year 1	What are plants? What happens when seasons change?		What materials are objects made from?		What are animals?	
Year 2	How do plants grow?	How are plants and animals suited to their habitats?	What can different materials be used for?		What do animals need to survive?	
Year 3	How are rocks the same and different?		What are forces?	What effect does light have on its surroundings?	How do plants function?	What enables animals to move? How do animals get nutrients from food?
Year 4	How do states of matter change?		What does vibration have to do with sound?	How does an electrical circuit work?	What is a food chain? How do environmental changes impact living things?	
Year 5	Can changes of state be reversed?		What effect do forces have on an object?	How does the Earth move through space?	How do plants and animals reproduce?	How do human bodies change with age?
Year 6	How does light travel?	How do components of an electrical circuit function?	Why are animals classified into groups?	How have plants and animals evolved over time?	What is happening inside the human body?	
Year 7	Introduction to Science, Cells	Particle Theory, Forces	Body Systems, Elements, Compounds and Mixtures (start)	Elements, Compounds and Mixtures (finish), Chemical Reactions	Sound Reproduction	Reproduction
Year 8	The Periodic Table	Health and Lifestyle, Chemical Reactions	Electricity and Magnetism	Adaptation and Inheritance, Metals, Acids and Alkalis	Energy	Light
Year 9	KS3- Separation Techniques	KS3- Ecosystems and Natural Processes	KS3- Earth and Space	GCSE- C1 Atomic Structure and Periodic Table	GCSE- B1 Cell Biology	GCSE- P1 Energy
Year 10	Biology: Cell Structure Chemistry: Atomic structure and the periodic table Physics: Energy	Biology: Organisation Chemistry: Bonding, structure and the properties of matter Physics: Electricity	Biology: Infection and Response Chemistry: Quantitative chemistry Physics: Particle model of matter	Biology B4- Bioenergetics Chemistry C4- Chemical changes Physics- P4 Atomic structure	Chemistry- C5- Energy changes	
Year 11	Biology B5- Homeostasis and Response Chemistry C6- The rate and extent of chemical change Physics P5- Forces	Biology- B6- Inheritance, variation and evolution Chemistry C7- Organic chemistry Physics P6- Waves	Biology- B7- Ecology Chemistry C8- Chemical analysis Physics P7- Magnetism and electromagnetism	Chemistry: Chemistry of the atmosphere Physics: Space	Chemistry: Using resources	
Year 12 Biology	Foundations in biology		Exchange and transport		Biodiversity, evolution and disease	
Year 13 Biology	Communication, homeostasis and energy			Genetics, evolution and ecosystems		
Year 12 Chemistry	Physical Chemistry			Inorganic Chemistry		
Year 13 Chemistry	Inorganic Chemistry			Organic Chemistry		
Year 12 Physics	Measurements and their errors	Particles and Radiation	Waves	Mechanics and Materials	Electricity	
Year 13 Physics	Further mechanisms and thermal physics		Fields and their consequences	Nuclear Physics	Turning points in Physics	

Implementation – GCSE Combined Science (AQA)

Component title	Content Overview
Biology Paper 1 16.7% 1 hour and 15 minutes written paper	· Cell Biology · Organisation; · Infection and response · Bioenergetics
Biology Paper 2 16.7% 1 hour and 15 minutes written paper	· Homeostasis and response · Inheritance, variation and evolution · Ecology
Chemistry Paper 1 16.7% 1 hour and 15 minutes written paper	· Atomic structure and the periodic table · Bonding, structure, and the properties of matter · Quantitative chemistry · Chemical changes · Energy changes
Chemistry Paper 2 16.7% 1 hour and 15 minutes written paper	· The rate and extent of chemical change · Organic chemistry · Chemical analysis · Chemistry of the atmosphere · Using resources
Physics Paper 1 16.7% 1 hour and 15 minutes written paper	· Energy · Electricity · Particle model of matter · Atomic structure
Physics Paper 2 16.7% 1 hour and 15 minutes written paper	· Forces · Waves · Magnetism and electromagnetism

Implementation – GCSE Biology, Chemistry and Physics – separate sciences (AQA)

Component title	Content Overview
Biology Paper 1 50% of Biology GCSE 1 hour and 45 minutes written paper	· Cell Biology · Organisation; · Infection and response · Bioenergetics
Biology Paper 2 50% of Biology GCSE 1 hour and 45 minutes written paper	· Homeostasis and response · Inheritance, variation and evolution · Ecology
Chemistry Paper 1 50% of Chemistry GCSE 1 hour and 45 minutes written paper	· Atomic structure and the periodic table · Bonding, structure, and the properties of matter · Quantitative chemistry · Chemical changes · Energy changes
Chemistry Paper 2 50% of Chemistry GCSE 1 hour and 45 minutes written paper	· The rate and extent of chemical change · Organic chemistry · Chemical analysis · Chemistry of the atmosphere · Using resources
Physics Paper 1 50% of Physics GCSE 1 hour and 45 minutes written paper	· Energy · Electricity · Particle model of matter · Atomic structure
Physics Paper 2 50% of Physics GCSE 1 hour and 45 minutes written paper	· Forces · Waves · Magnetism and electromagnetism · Space physics

Implementation – A-level Biology

Component title	Content Overview
Development of Practical Skills in Biology	You will complete twelve Biology required practicals throughout the course, which link to subject content that you will be learning. These practicals will be assessed in the written examinations.
Foundations in Biology	What are the functions of the organelles found in an animal and plant cell? How is the body made of up of biological molecules? What is the structure of DNA and what is it purpose? How do enzymes help speed up metabolic processes in the body? What is the structure of a biological membrane and how does this help with it's functioning? How does cell division occur in the human body?
Exchange and Transport	What are the different examples of exchange surfaces in the body? How are exchange surfaces adapted to function effectively? What are the transport mechanisms in animals? What are the transport mechanisms in plants?
Biodiversity, Evolution and Disease	What causes communicable diseases? How does the immune system fight off antigens? Why is biodiversity so important? How do we classify organisms based on structural and behavioural features? What are the theories of evolution?
Communication, Homeostasis and Energy	What are the types of homeostatic processes in the body? How does the body get rid of unwanted excretory products? How do we communicate within the body by neurons? How do we communicate within the body using hormones? How do organisms react to external stimuli? What is the light-dependent and light-independent stages of photosynthesis? How does the body make energy?
Genetics, Evolution and Ecosystems	How do we inherit genes? What are the patterns of inheritance? How can we manipulate genomes i.e. to make insulin? How is biotechnology used to produce clones? What is the importance of different ecosystems? What happens in the population growth curve?

Implementation – A-level Chemistry

Component title	Content Overview
Practical Requirements	You will complete twelve Chemistry required practicals throughout the course, which link to subject content that you will be learning. These practicals will be assessed in the written examinations.
Physical	How has the atom changed overtime? How do you calculate the amount of a substance? How is Carbon-12 important to mole concept? How many electrons exist in elements and how are electrons involved in bonding?
Organic Chemistry	What is the structure of a hydrocarbon? What is the structure and properties of alcohols and haloalkanes? How is organic synthesis important to industry? What are the different types of analytical techniques?
Inorganic Chemistry	What is the trend in physical properties of halogens? What is the trend in the electronegativity of halogens? What is the trend in physical properties of period three elements? How is chlorine useful in water treatment?
Physical	What happens during enthalpy changes? What factors affect reaction rates? What are the properties of a systematic equilibrium? How do we measure enthalpy, entropy and free energy? Why are electrode potentials important?
Organic Chemistry	How are aromatic compounds produced? How do we differentiate between carbonyl compounds? What are carboxylic acids? How are esters made? What is the importance of nitrogen compounds?
Inorganic Chemistry	What are transition metal elements? How can the identity of a transition metal be found using their coloured complexes? How does the acid-base character of the oxides of period three metals change going across the period?

Implementation – A-level Physics

Component title	Content Overview
Development of Practical Skills in Physics	You will complete twelve Physics required practicals during the course, which link to subject content that you will be learning. These practicals will be assessed in the written examinations. How are S.I base units used to make measurements? How do we deal with systematic and random errors in measurement? How do resolve vector quantities into perpendicular components?
Particles and Radiation	What is the photoelectric effect? What are the particle interactions? What are particles, antiparticles & photons? What are quarks & antiquarks? What is wave-particle duality?
Mechanics and Materials	What are Newtons Law of motion, moments and momentum? How do forces affect a body in action? How do you calculate work, energy and power? How do you calculate spring constant? How do you calculate the linear and projectile motion of objects? What is Young's Modulus and how to determine the Young Modulus of a material?
Electricity	How do you calculate charge, current, p.d. and resistance in an electrical circuit? How do you distinguish between e.m.f. and p.d. and determine the internal resistance in a power cell? How does the resistivity of a material vary the current in a circuit? What are Kirchhoff's Laws? What is a potential divider and how to determine the voltage output of a potential divider circuit?
Field and their Consequences	How to determine the similarities and difference between the electric and gravitational field? What is Coulomb's Law? What is a capacitor and how to determine the capacitance? What is a magnetic flux and magnetic flux density? How to determine the motion of a charge through a magnetic field?
Nuclear Physics	What is radioactivity? What are the types of radiation decay? How to determine nuclear radius of an atom? What is induced nuclear fission? What is nuclear instability?

Impact

Teacher guiding of first practise supports pupils with new knowledge and skills when they first use it and ensures that misconceptions are immediately rectified. Pupils are targeted for guiding based on the assessment information gleaned from lesson questioning and distance feedback.

Learning tasks are differentiated so that pupils focus on their precise next steps and practise what they most need to practise. Distance feedback, questioning and guiding allows the teacher to glean the assessment information necessary to plan this.

Teachers monitor and track development of skills and understanding of content and plan future learning accordingly.

Secondary section teachers complete class feedback logs to provide distance feedback. These identify individual, group and whole class misconceptions which are used to plan the next lesson's explanations, questioning, next steps and guided group.

Teacher questioning about and after all explanations, using techniques to ensure that all pupils are included in the questioning, allows the teacher to assess the level of understanding of their teaching. This allows future explanations to be planned during lessons. This keeps pupils at the point of learning.

Questioning, live tweaks to explanations, teacher guiding, a focus on next steps and class feedback logs all ensure that any knowledge or skill gaps are immediately closed so that pupils have the key information needed for subsequent learning, lessons and examinations.

Year 10, Year 11 and Sixth Form pupils complete an assessment or examination each half term. These assessments match final examination criteria and generate working at grades for the pupils for that particular content. This assessment, combined with ongoing teacher assessment and professional judgement is used to generate half termly predicted grades. Predicted grades are the Science department's judgement as to the grades pupils are most likely to achieve in the final GCSE and A-level examinations.