

Beths Grammar School KS\$ Physics Y10 Curriculum Map

GCSE OCR A- Gateway Science Suite

Term	INTENT	IMPLEMENTATION	IMPACT
	Substantive Knowledge This is the specific, factual content for the topic, which should be connected into a careful sequence of learning.	Disciplinary Knowledge (Skills) This is the action taken within a particular topic in order to gain substantive knowledge.	Assessment opportunities What assessments will be used to measure student progress? Evidence of how well students have learned the intended content.
Autumn Term 1A Year 10	Intent Why is this taught now?	P1.1d Define density. P1.1e Explain the differences in density between the different states of matter in terms of the arrangements of the atoms and molecules. P1.1f Apply the relationship between density, mass, and volume to changes where mass is conserved. PM1.1i Recall and apply: $\text{density (kg / m}^3\text{)} = \text{mass (kg)} / \text{volume (m}^3\text{)}$. P1.2b Describe that physical changes differ from chemical changes because the material recovers its original properties if the change is reversed. P1.2c Describe how heating a system will change the energy stored within the system and raise its temperature or produce changes of state. M4c Plot two variables from experimental or other data. P1.2d Define the term specific heat capacity and distinguish between it and the term specific latent heat. P1.2e Apply the relationship between change in internal energy of a material and its mass, specific heat capacity, and temperature change to calculate the energy change involved. PM1.2i Apply: $\text{change in thermal energy (J)} = \text{mass (kg)} \times \text{specific heat capacity (J / kg}^\circ\text{C)} \times \text{change in temperature (}^\circ\text{C)}$. P1.2f Apply the relationship between specific latent heat and mass to calculate the energy change involved in a change of state.	Classwork and homework tasks. A formal unit test will be sat by all students approximately three weeks before planned report dates.
	P1.2 A clear understanding of the foundations of the physical world forms a solid basis for further study of physics. Understanding of the relationship between the states of matter helps to explain different types of everyday physical changes that we see around us. Learners should be familiar with the structure of matter and the similarities and differences between solids, liquids and gases. They should have an idea of the particle model and be able to use it to model changes in particle behaviour during changes of state. Learners should be aware of the effect of temperature in the motion and spacing of particles and an understanding that energy can be stored internally by materials.		

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		PM1.2ii Apply: thermal energy for a change in state (J) = mass (kg) $\times$ specific latent heat (J / kg). WS1.1b Use models to solve problems, make predictions, and develop scientific explanations and understanding of familiar and unfamiliar facts. WS1.2a Use scientific theories and explanations to develop hypotheses. WS1.2b Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data, or explore phenomena. WS1.2e Evaluate methods and suggest possible improvements and further investigations. WS1.3g Evaluate data in terms of accuracy, precision, repeatability, and reproducibility. WS1.4a Use scientific vocabulary, terminology, and definitions. WS1.4b Recognise the importance of scientific quantities and understand how they are determined. WS1.4f Use an appropriate number of significant figures in calculations.	
Autumn Term 1B Year 10	<u>Intent</u> Why is this taught now?	P1.3a Explain how the motion of the molecules in a gas is related to both its temperature and its pressure. P1.3b Explain the relationship between the temperature of a gas and its pressure at constant volume (qualitative only). M2b Find arithmetic means. M4b Understand that $y = mx + c$ represents a linear relationship. P1.3c Recall that gases can be compressed or expanded by pressure changes and that the pressure produces a net force at right angles to any surface. P1.3d Explain how increasing the volume in which a gas is contained, at constant temperature, can lead to a decrease in pressure. P1.3e Explain how doing work on a gas can increase its temperature. PM1.3i Apply: for gases: pressure (Pa) $\times$ volume (m^3) = constant (for a given mass of gas and at a constant temperature).	Classwork and homework tasks. A formal unit test will be sat by all students approximately three weeks before planned report dates.
	P1.3 This section develops the understanding of pressure in gases and liquids. Pressure in gases builds on the particle model, and in liquids the increase in pressure with depth is explained as the weight of a column of liquid acting on a unit area. Learners should be aware of the change in pressure in the atmosphere and in liquids with height (qualitative relationship only). They should have an understanding of floating and sinking and the effect of upthrust. Learners should know that pressure is measured by a ratio of force over area which is acting at a normal to the surface.		

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		P1.3f Describe a simple model of the Earth's atmosphere and of atmospheric pressure. P1.3g Explain why atmospheric pressure varies with height above the surface of the planet. M1c Use ratios, fractions, and percentages. M4a Translate information between graphical and numeric form. M4c Plot two variables from experimental or other data. P1.3i Explain why pressure in a liquid varies with depth and density and how this leads to an upwards force on a partially submerged object. P1.3j Calculate the differences in pressure at different depths in a liquid. PM3.1ii Apply: pressure due to a column of liquid (Pa) = height of column (m) $\times$ density of liquid (kg/m³) $\times$ g (N/kg). P1.3h Describe the factors which influence floating and sinking. M3b Change the subject of an equation. M3c Substitute numerical values into algebraic equations using appropriate units for physical quantities. WS1.1b Use models to solve problems, make predictions, and develop scientific explanations and understanding of familiar and unfamiliar facts. WS1.3c Carry out and represent mathematical and statistical analysis. WS1.3e Interpret observations and other data. WS1.3f Present reasoned explanations. WS1.4a Use scientific vocabulary, terminology, and definitions. WS1.4b Recognise the importance of scientific quantities and understand how they are determined. WS1.4f Use an appropriate number of significant figures in calculations. WS2a Carry out experiments. WS2b Make and record observations and measurements using a range of apparatus and methods. WS2c Present observations using appropriate methods. WS2d Communicate the scientific rationale for investigations, methods used, findings, and reasoned conclusions.	
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Spring Term 2A Year 10	Intent Why is this taught now? P3.1 Having established the nature of matter, consideration is now given to the interactions between matter and electrostatic fields. These interactions are derived from the structure of matter which was considered in Topic P1. The generation of charge is considered. Charge is a fundamental property of matter. There are two types of charge which are given the names 'positive' and 'negative'. Learners should be aware of electron transfer leading to objects becoming statically charged and the forces between them. They should also be aware of the existence of an electric field. P3.2 Electrical currents depend on the movement of charge and the interaction of electrostatic fields. Electrical current, potential difference and resistance are all discussed in this section. The relationship between them is considered and learners will investigate this using circuits. Learners should have been introduced to the measurement of conventional current and potential difference in circuits. They will have an understanding of how to assemble series and parallel circuits and of how they differ with respect to conventional current and potential difference. Learners are expected to have an awareness of the relationship between potential difference, current and resistance and the units in which they are measured.	P3.1a Describe that charge is a property of all matter and that there are positive and negative charges. The effects of the charges are not normally seen on bodies containing equal amounts of positive and negative charge, as their effects cancel each other out. P3.1b Describe the production of static electricity and sparking by rubbing surfaces, and describe evidence that charged objects exert forces of attraction or repulsion on one another when not in contact. P3.1c Explain how transfer of electrons between objects can explain the phenomenon of static electricity. P3.1d Explain the concept of an electric field and how it helps to explain the phenomenon of static electricity. P3.1e Recall that current is a rate of flow of charge (electrons) and the conditions needed for charge to flow. P3.1g Recall and use the relationship between quantity of charge, current, and time. PM3.1i Recall and apply: charge flow (C) = current (A) × time (s). M1c Use ratios, fractions, and percentages. M1b Recognise and use expressions in standard form. WS1.1e Explain everyday and technological applications of science. WS1.2a Use scientific theories and explanations to develop hypotheses. WS1.3e Interpret observations and other data. WS1.3f Present reasoned explanations. WS2a Carry out experiments. WS1.4b Recognise the importance of scientific quantities and understand how they are determined. WS1.4c Use SI units and IUPAC chemical nomenclature unless inappropriate. WS1.4e Interconvert units. WS1.4f Use an appropriate number of significant figures in calculations.	Classwork and homework tasks. A formal unit test will be sat by all students approximately three weeks before planned report dates.
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	Links to Sustainability Compare traditional lighting circuits with modern LED systems in homes and schools. Investigate why efficient appliances produce less wasted energy as heat. Link to energy-efficient design. Compare the power ratings and running costs of appliances. Introduce energy-saving behaviours and appliance choices	P3.2b Represent d.c. circuits with the conventions of positive and negative terminals and the symbols that represent common circuit elements. P3.2c Recall that current (I) depends on both resistance (R) and potential difference (V), and recall the units in which these are measured. PM3.2ii Recall and apply: energy transferred (J) = charge (C) × potential difference (V). P3.2a Describe the differences between series and parallel circuits. P3.1f Recall that current has the same value at any point in a single closed loop. M3d Solve simple algebraic equations. P3.2f Explain the design and use of circuits to explain such effects. P3.2m Apply the equations relating potential difference, current, quantity of charge, resistance, power, energy, and time, and solve problems for circuits which include resistors in series using the concept of equivalent resistance. PM3.2i Recall and apply: potential difference (V) = current (A) × resistance (Ω). M1b Recognise and use expressions in standard form. M1c Use ratios, fractions, and percentages. P3.2d Recall and apply the relationship between I, R, and V, and recall that for some resistors the value of R remains constant but that for others it can change as the current changes. P3.2e Explain that for some resistors the value of R remains constant but that in others it can change as the current changes. P3.2g Use graphs to explore whether circuit elements are linear or non-linear. P3.2h Use graphs and relate the curves produced to the function and properties of circuit elements. M4c Plot two variables from experimental or other data. P3.2f Explain the design and use of circuits to explore effects [of the relationship between I, R, and V]. M4b Understand that $y = mx + c$ represents a linear relationship.	
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		WS1.1b Use models to solve problems, make predictions, and develop scientific explanations and understanding of familiar and unfamiliar facts. WS1.1e Explain everyday and technological applications of science. WS1.2a Use scientific theories and explanations to develop hypotheses. WS1.2b Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data, or explore phenomena. WS1.2c Apply a knowledge of a range of techniques, instruments, apparatus, and materials to select those appropriate to the experiment. WS1.3e Interpret observations and other data. WS1.3f Present reasoned explanations. WS1.3h Identify potential sources of random and systematic error. WS2a Carry out experiments. WS2b Make and record observations and measurements using a range of apparatus and methods. WS2c Present observations using appropriate methods. WS2d Communicate the scientific rationale for investigations, methods used, findings, and reasoned conclusions.	
Spring Term 2B Year 10	Intent Why is this taught now?	P3.2i Explain why, if two resistors are in series, the net resistance is increased, whereas with two in parallel the net resistance is decreased (qualitative explanation only). P3.2j Calculate the currents, potential differences, and resistances in d.c. series and parallel circuits. P3.2m Apply the equations relating potential difference, current, quantity of charge, resistance, power, energy, and time, and solve problems for circuits which include resistors in series using the concept of equivalent resistance. PM3.2i Recall and apply: potential difference (V) = current (A) × resistance (Ω). M1c Use ratios, fractions, and percentages.	Classwork and homework tasks. A formal unit test will be sat by all students approximately three weeks before planned report dates.
	P3.2 Continuing the work started in term 2A. P4.1 Having an understanding of how charge can be generated and its effects, we can now consider the link between movement of charge and magnetism. To begin, learners will investigate magnets and magnetic fields around magnets and current-carrying wires.		

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	Learners should have been introduced to magnets and the idea of attractive and repulsive forces. They should have an idea of the shape of the fields around bar magnets. Learners are expected to have an awareness of the magnetic effect of a current and electromagnets.	P3.2k Explain the design and use of such circuits for measurement and testing purposes. P3.2l Explain how the power transfer in any circuit device is related to the potential difference across it and the current, and to the energy changes over a given time. PM3.2iii Recall and apply: power (W) = potential difference (V) × current (A) = (current (A))² × resistance (Ω). PM3.2iv Recall and apply: energy transferred (J, kWh) = power (W, kW) × time (s, h) = charge (C) × potential difference (V). WS1.1b Use models to solve problems, make predictions, and develop scientific explanations and understanding of familiar and unfamiliar facts. WS1.2a Use scientific theories and explanations to develop hypotheses. WS1.2b Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data, or explore phenomena. WS1.2c Apply a knowledge of a range of techniques, instruments, apparatus, and materials to select those appropriate to the experiment. WS1.3e Interpret observations. WS1.3f Present reasoned explanations. WS1.3i communicating the scientific rationale for investigations, methods used, findings and reasoned conclusions. WS2a Carry out experiments. WS2b Make and record observations and measurements using a range of apparatus and methods. P4.1a Describe the attraction and repulsion between unlike and like poles for permanent magnets. P4.1b Describe the difference between permanent and induced magnets. P4.1c Describe the characteristics of the magnetic field of a magnet, showing how strength and direction change from one point to another.	
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		P4.1d Explain how the behaviour of a magnetic (dipping) compass is related to evidence that the core of the Earth must be magnetic. M5b Visualise and represent 2D and 3D forms including 2D representations of 3D objects. P4.1e Describe how to show that a current can create a magnetic effect and describe the directions of the magnetic field around a conducting wire. P4.1f Recall that the strength of the field depends on the current and the distance from the conductor. P4.1g Explain how solenoid arrangements can enhance the magnetic effect. M1c Use ratios, fractions, and percentages. M2g Use a scatter diagram to identify a correlation between two variables. WS1.2a Use scientific theories and explanations to develop hypotheses. WS1.2b Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data, or explore phenomena. WS2a Carry out experiments. WS2b Make and record observations and measurements using a range of apparatus and methods. WS2c Present observations using appropriate methods. WS2d Communicate the scientific rationale for investigations, methods used, findings, and reasoned conclusions.	
Summer Term 3A Year 10	Intent Why is this taught now?	P4.2a Describe how a magnet and a current-carrying conductor exert a force on one another. P4.2b Show that Fleming's left-hand rule represents the relative orientations of the force, the conductor, and the magnetic field. P4.2c Apply the equation that links the force on a conductor to the magnetic flux density, the current, and the length of conductor to calculate the forces involved. PM4.2i Apply: force on a conductor (at right angles to a magnetic field) carrying a current $(N) = \text{magnetic flux density } (T) \times \text{current } (A) \times \text{length } (m)$	Classwork and homework tasks. A formal unit test will be sat by all students approximately three weeks before planned report dates.
	P4.2 Forces show the existence of fields and how they interact with one another but here the force itself is discussed in more depth and then quantified. These forces also lead to the use of magnetic fields to induce electrical currents and the applications of this electromagnetic induction in motors, dynamos and		

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	transformers. This topic will predominantly be new content for learners with some understanding of D.C. motors. Learners will have looked at fields in the previous subtopic and now this knowledge will be built on to give learners the understanding of the application, P5.1 Waves are means of transferring energy and the two main types of wave are introduced in this section: mechanical and electromagnetic. This section considers both what these types of waves are and how they are used. The main terms used to describe waves are defined and exemplified in this topic. Learners should have prior knowledge of transverse and longitudinal waves through sound and light. Learners should be aware of how waves behave and how the speed of a wave may change as it passes through different media. They may already have knowledge of how sound is heard and the hearing ranges of different species.	P4.2d Explain how the force exerted from a magnet and a current-carrying conductor is used to cause rotation in electric motors. M5b Visualise and represent 2D and 3D forms including 2D representations of 3D objects. P4.2e Recall that a change in the magnetic field around a conductor can give rise to an induced potential difference across its ends, which could drive a current, generating a magnetic field that would oppose the original change. M1c Use ratios, fractions, and percentages. M4c Plot two variables from experimental or other data. P4.2g Explain how the effect of an alternating current in one circuit, in inducing a current in another, is used in transformers. P4.2h Explain how the ratio of the potential differences across two transformers depends on the ratio of the numbers of turns in each transformer. P4.2i Apply the equations linking the potential differences and numbers of turns in the two coils of a transformer to the currents. PM4.2ii Apply: $\text{potential difference across primary coil (V)} / \text{potential difference across secondary coil (V)} = \text{number of turns in primary coil} / \text{number of turns in secondary coil}$ P4.2j Explain the action of the microphone in converting the pressure variations in sound waves into variations in current in electrical circuits, and explain the reverse effect as used in loudspeakers and headphones. WS1.1b Use models to solve problems, make predictions, and develop scientific explanations and understanding of familiar and unfamiliar facts. WS1.1e Explain everyday and technological applications of science. WS1.2a Use scientific theories and explanations to develop hypotheses. WS1.2b Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data, or explore phenomena.	
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		WS1.3a Present observations and other data using appropriate methods. WS1.3e Interpret observations and other data. WS1.3f Present reasoned explanations. WS2a Carry out experiments. WS2b Make and record observations and measurements using a range of apparatus and methods. P5.1a Describe wave motion in terms of amplitude, wavelength, frequency, and period. P5.1b Define wavelength and frequency. P5.1e Describe differences between transverse and longitudinal waves. P5.1j Describe how ripples on water surfaces are used to model transverse waves, whereas sound waves in air are longitudinal waves, and how the speed of each may be measured. P5.1k Describe evidence that in both cases it is the wave and not the water or air itself that travels. M5b Visualise and represent 2D and 3D forms including 2D representations of 3D objects. P5.1c Describe and apply the relationship between wavelength and frequency and the wave velocity. P5.1d Apply formulae relating velocity, frequency, and wavelength. PM5.1i Recall and apply: wave speed (m/s) = frequency (Hz) × wavelength (m). WS1.1b Use models to solve problems, make predictions, and develop scientific explanations and understanding of familiar and unfamiliar facts. WS1.3a Present observations and other data using appropriate methods. WS1.3b Translate data from one form to another. WS1.3c Carry out and represent mathematical and statistical analysis. WS1.3d Represent distributions of results and make estimations of uncertainty. WS1.3e Interpret observations and other data.	
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		WS1.3g Evaluate data in terms of accuracy, precision, repeatability, and reproducibility. WS1.3h Identify potential sources of random and systematic error. WS2a Carry out experiments. WS2b Make and record observations and measurements using a range of apparatus and methods.	
Summer Term 3B Year 10	Intent Why is this taught now?	P5.1f Show how changes in velocity, frequency, and wavelength, in the transmission of sound waves from one medium to another, are inter-related. P5.1g Describe the effects of reflection, transmission, and absorption of waves at a material interface. PM5.1i Recall and apply: wave speed (m/s) = frequency (Hz) × wavelength (m) P5.1h Describe, with examples, processes which convert wave disturbances between sound waves and vibrations in solids. P5.1i Explain why such processes only work over a limited frequency range and the relevance of this to human hearing. WS1.1b Use models to solve problems, make predictions, and develop scientific explanations and understanding of familiar and unfamiliar facts. WS1.1e Explain everyday and technological applications of science. WS1.1f Evaluate personal, social, economic, and environmental implications of everyday and technological applications of science. WS1.3b Translate data from one form to another. WS1.3e Interpret observations and other data. WS1.4a Use scientific vocabulary, terminology, and definitions. WS1.4b Recognise the importance of scientific quantities and understand how they are determined. P5.2a Recall that electromagnetic waves are transverse and are transmitted through space where all have the same velocity. P5.2b Explain that electromagnetic waves transfer energy from source to absorber.	Classwork and homework tasks. A formal end of year test will be sat by all students.
	P5.1 Continuing the work started in term 3A. P5.2 Having looked at mechanical waves, waves in the electromagnetic spectrum are now considered. This section includes the application of electromagnetic waves with a specific focus on the behaviour of light. Alongside this, it explores the application of other types of electromagnetic radiation for use in medical imaging. Learners may be familiar with uses of some types of radiation but an understanding of all parts of the electromagnetic spectrum is not expected and should be taught as new content.		

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		P5.2c Apply the relationships between frequency and wavelength across the electromagnetic spectrum. P5.2d Describe the main groupings of the electromagnetic spectrum and explain that these groupings range from long to short wavelengths and from low to high frequencies. PM5.1i Recall and apply: wave speed (m/s) = frequency (Hz) × wavelength (m). P5.2e Recall that your eyes can detect only a limited range of the electromagnetic spectrum. P5.2f Recall that light is an electromagnetic wave. P5.2g Give examples of some practical uses of electromagnetic waves in the radio, microwave, infrared, visible, ultraviolet, X-ray, and gamma-ray regions. P5.2h Describe how ultraviolet waves, X-rays, and gamma rays can have hazardous effects, notably on human bodily tissues. P5.2j Recall that radio waves can be produced by, or can themselves induce, oscillations in electrical circuits. P5.2i Explain, in qualitative terms, how the differences in velocity, absorption, and reflection between different types of waves in solids and liquids can be used both for detection and for exploration of structures which are hidden from direct observation, notably in our bodies. WS1.1b Use models to solve problems, make predictions, and develop scientific explanations and understanding of familiar and unfamiliar facts. WS1.1c Understand the power and limitations of science. WS1.1e Explain everyday and technological applications of science. WS1.1f Evaluate associated personal, social, economic, and environmental implications. WS1.1h Evaluate risks in both practical science and the wider societal context. WS1.1i Recognise the importance of peer review of results and of communicating results to a range of audiences. WS1.4a Use scientific vocabulary, terminology, and definitions.	
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