

Beths Grammar School KS3 Physics Curriculum Map

Term	<b>INTENT</b>	<b>IMPLEMENTATION</b>	<b>IMPACT</b>
<b>OCR Gateway Suite</b>	<p><b>Substantive Knowledge</b></p> <p>This is the specific, factual content for the topic, which should be connected into a careful sequence of learning.</p>	<p><b>Disciplinary Knowledge (Skills)</b></p> <p>This is the action taken within a particular topic in order to gain substantive knowledge.</p>	<p><b>Assessment opportunities</b></p> <p>What assessments will be used to measure student progress? Evidence of how well students have learned the intended content.</p>
<b>Autumn Term 1A Year 9</b>	<p><u>Intent</u></p> <p>Why is this taught now?</p> <p>P2.1</p> <p>From their work in Key Stage 3 Science, learners will have a basic knowledge of the mathematical relationship between speed, distance and time. They will move on to understanding the relationships in more depth including representing this information in motion graphs, an understanding of relative motion of objects and an understanding of acceleration and kinetic energy.</p>	<p>P2.1a Describe how to measure distance and time in a range of scenarios.</p> <p>P2.1b Describe how to measure distance and time and use them to calculate speed.</p> <p>P2.1c Make calculations using ratios and proportional reasoning to convert units and to compute rates.</p> <p>PM2.1i Recall and apply: distance travelled (m) = speed (m/s) × time (s)</p> <p>M1c Use ratios, fractions, and percentages.</p> <p>P2.1d Explain the vector–scalar distinction as it applies to displacement and distance, velocity and speed.</p> <p>P2.1h Apply formulae relating distance, time, and speed for uniform motion and for motion with uniform acceleration</p> <p>PM2.1ii Recall and apply: acceleration (m/s<sup>2</sup>) = change in speed (m/s) / time (s)</p> <p>M1c Use ratios, fractions, and percentages.</p> <p>M2b Find arithmetic means.</p> <p>P2.1e Relate changes and differences in motion to appropriate distance–time and velocity–time graphs, and interpret lines, slopes, and enclosed areas in such graphs</p> <p>PM2.1i Recall and apply: distance travelled (m) = speed (m/s) × time (s)</p> <p>M1c Use ratios, fractions, and percentages.</p> <p>M2f Understand the terms mean, mode, and median.</p>	<p>Classwork and homework tasks.</p> <p>A formal unit test will be sat by all students approximately three weeks before the first Y9 report. This could be in term 1B.</p>

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		<p>P2.1e Relate changes and differences in motion to appropriate distance–time and velocity–time graphs, and interpret lines, slopes, and enclosed areas in such graphs</p> <p>P2.1f Interpret enclosed area in velocity–time graphs</p> <p>PM2.1i Recall and apply: distance travelled (m) = speed (m/s) × time (s)</p> <p>PM2.1ii Recall and apply: acceleration (m/s<sup>2</sup>) = change in speed (m/s) / time (s)</p> <p>M4f Understand the physical significance of the area between a curve and the x-axis and measure it by counting squares as appropriate.</p> <p>P2.1h Apply formulae relating distance, time, and speed for uniform motion and for motion with uniform acceleration.</p> <p>PM2.1iii Apply: <math>(\text{final velocity (m/s)})^2 - (\text{initial velocity (m/s)})^2 = 2 \times \text{acceleration (m/s}^2) \times \text{distance (m)}</math>.</p> <p>PM2.1iv Recall and apply: kinetic energy (J) = 0.5 × mass (kg) × (speed (m/s))<sup>2</sup></p> <p>WS1.2c Apply a knowledge of a range of techniques, instruments, apparatus, and materials to select those appropriate to the experiment.</p> <p>WS1.3i Communicate the scientific rationale for investigations, methods used, findings, and reasoned conclusions.</p> <p>WS1.4c Use SI units and IUPAC chemical nomenclature unless inappropriate.</p> <p>WS1.4e Interconvert units.</p> <p>WS1.4a Use scientific vocabulary, terminology, and definitions</p> <p>WS1.3a Present observations and other data using appropriate methods.</p> <p>WS1.3b Translate data from one form to another.</p> <p>WS1.3c Carry out and represent mathematical and statistical analysis.</p> <p>WS1.2e Evaluate methods and suggest possible improvements and further investigations.</p> <p>WS1.3g Evaluate data in terms of accuracy, precision, repeatability, and reproducibility.</p> <p>WS1.3h Identify potential sources of random and systematic error.</p>	
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		<p>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.          WS2b Make and record observations and measurements using a range of apparatus and methods.          WS1.3c Carrying out and representing mathematical and statistical analysis.          WS1.3g Evaluating data in terms of accuracy, precision, repeatability and reproducibility.</p>	
<p><b>Autumn Term 1B Year 9</b></p>	<p><u><b>Intent</b></u>          Why is this taught now?          P2.2          Following on from the work on kinematics in term 1A the learners are introduced to the links between forces and motion. Newton’s laws of motion essentially define the means by which motion changes and the relationship between these changes in motion with force and mass.          This work continues the knowledge gained at KS3 including:          Forces as pushes or pulls, arising from the interaction between two objects          Using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces          Forces being needed to cause objects to stop or start moving, or to change their speed or direction of motion (qualitative only)          Change depending on direction of force and size</p>	<p>P2.2a Recall examples of ways in which objects interact.          P2.2b Describe how such examples involve interactions between pairs of objects which produce a force on each object.          P2.2p Recall and apply Newton’s Third Law.          P2.2b Describe how examples [of the way in which objects interact] involve interactions between pairs of objects which produce a force on each object.          P2.2c Represent such forces as vectors.          P2.2e Use vector diagrams to illustrate resolution of forces, a net force, and equilibrium situations.          M4a Translate information between graphical and numeric form.          M5a Use angular measures in degrees.          M5b Visualise and represent 2D and 3D forms including 2D representations of 3D objects.          P2.2d Apply Newton’s First Law to explain the motion of an object moving with uniform velocity and also an object where the speed and/or direction change.          P2.2h Describe, using free body diagrams, examples of the special case where forces balance to produce a resultant force of zero.          P2.2j Explain that inertia is a measure of how difficult it is to change the velocity of an object and that the mass is defined as the ratio of force over acceleration.</p>	<p>Classwork and homework tasks.</p>

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		<p>P2.2g Describe, using free body diagrams, examples where two or more forces lead to a resultant force on an object (qualitative only).</p> <p>P2.2i Apply Newton’s Second Law in calculations relating forces, masses, and accelerations.</p> <p>P2.2q Explain why an object moving in a circle with a constant speed has a changing velocity (qualitative only).</p> <p>PM2.2i Recall and apply: force (N) = mass (kg) × acceleration (m/s<sup>2</sup>).</p> <p>WS1.4a Use scientific vocabulary, terminology, and definitions.</p> <p>WS1.4b Recognise the importance of scientific quantities and understand how they are determined.</p> <p>WS1.3c Carry out and represent mathematical and statistical analysis.</p> <p>WS1.3e Interpret observations and other data.</p> <p>WS2a Carry out experiments.</p> <p>WS1.1a Understand how scientific methods and theories develop over time.</p> <p>WS1.2a Use scientific theories and explanations to develop hypotheses.</p> <p>WS1.2b Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data, or explore phenomena.</p> <p>WS1.2c Apply a knowledge of a range of techniques, instruments, apparatus, and materials to select those appropriate to the experiment.</p> <p>WS1.2e Evaluate methods and suggest possible improvements and further investigations.</p> <p>WS2b Make and record observations and measurements using a range of apparatus and methods.</p> <p>WS2c Present observations using appropriate methods.</p>	
<p><b>Spring Term 2A Year 9</b></p>	<p><b>Intent</b> Why is this taught now?</p> <hr/> <p>P2.2 Continuing the work started in term 1B</p>	<p>P2.2f Describe examples of the forces acting on an isolated solid object or system.</p> <hr/> <p>PM2.1i Recall and apply: distance travelled (m) = speed (m/s) × time (s).</p>	<p>Classwork and homework tasks.</p>

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P2.2k Define momentum and describe examples of momentum in collisions.

P2.2l Apply formulae relating force, mass, velocity, and acceleration to explain how the changes involved are inter-related.

PM2.2ii Recall and apply: momentum ( $\text{kg m/s}$ ) = mass ( $\text{kg}$ )  $\times$  velocity ( $\text{m/s}$ ).

P2.2m Use the relationship between work done, force, and distance moved along the line of action of the force and describe the energy transfer involved.

P2.2n Calculate relevant values of stored energy and energy transfers; convert between newton-metres and joules.

P2.2o Explain, with reference to examples, the definition of power as the rate at which energy is transferred.

PM2.2iii Recall and apply: work done ( $\text{J}$ ) = force ( $\text{N}$ )  $\times$  distance ( $\text{m}$ ) (along the line of action of the force).

PM2.2iv Recall and apply: power ( $\text{W}$ ) = work done ( $\text{J}$ ) / time ( $\text{s}$ ).

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.

WS1.2e Evaluate methods and suggest possible improvements and further investigations.

WS1.3a Present observations and other data using appropriate methods.

WS1.3c Carry out and represent mathematical and statistical analysis.

WS1.3e Interpret observations and other data.

WS2a Carry out experiments.

WS2b Make and record observations and measurements using a range of apparatus and methods.

WS2d Communicate the scientific rationale for investigations, methods used, findings, and reasoned conclusions.

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<p><b>Spring Term 2B Year 9</b></p>	<p><b>Intent</b> Why is this taught now?</p> <p>P2.3 Forces acting on an object can result in a change of shape or motion. Having looked at the nature of matter, we can now introduce the idea of fields and forces causing changes. This develops the idea that force interactions between objects can take place even if they are not in contact. Learners should be familiar with forces associated with deforming objects, with stretching and compressing (springs). This unit builds on the learners knowledge from KS3 of forces acting to deform objects and to restrict motion. They should already be familiar with Hooke’s Law and the idea that, when work is done by a force, it results in an energy transfer and leads to energy being stored by an object. Learners are expected to know that there is a force due to gravity and that gravitational field strength differs on other planets and stars.</p>	<p>P2.3a Explain that to stretch, bend, or compress an object, more than one force has to be applied.</p> <p>P2.3b Describe the difference between elastic and plastic deformation (distortions) caused by stretching forces.</p> <p>P2.3c Describe the relationship between force and extension for a spring and other simple systems.</p> <p>P2.3e Calculate a spring constant in linear cases.</p> <p>PM2.3i Recall and apply: force exerted by a spring (N) = extension (m) × spring constant (N/m).</p> <p>M4d Determine the slope and intercept of a linear graph.</p> <p>P2.3d Describe the difference between linear and non-linear relationships between force and extension.</p> <p>P2.3f Calculate the work done in stretching.</p> <p>PM2.3ii Apply: energy transferred in stretching (J) = 0.5 × spring constant (N/m) × (extension (m))<sup>2</sup>.</p> <p>M4a Translate information between graphical and numeric form.</p> <p>M4b Understand that <math>y = mx + c</math> represents a linear relationship.</p> <p>M4f Understand the physical significance of the area between a curve and the x-axis and measure it by counting squares as appropriate.</p> <p>P2.1h Apply formulae relating distance, time, and speed for uniform motion and for motion with uniform acceleration.</p> <p>PM2.1ii Recall and apply: acceleration (<math>m/s^2</math>) = change in speed (m/s) / time (s).</p> <p>M1c Use ratios, fractions, and percentages.</p> <p>M2b Find arithmetic means.</p> <p>P2.3k Describe examples in which forces cause rotation.</p> <p>P2.3l Define and calculate the moment of the force in such examples.</p> <p>PM2.3vi Recall and apply: moment of a force (N m) = force (N) × distance (m) (normal to direction of the force).</p> <p>WS1.1e Explain everyday and technological applications of science.</p>	<p>Classwork and homework tasks.</p>
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		<p>WS1.2b Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data, or explore phenomena.</p> <p>WS1.2c Apply a knowledge of a range of techniques, instruments, apparatus, and materials to select those appropriate to the experiment.</p> <p>WS1.2e Evaluate methods and suggest possible improvements and further investigations.</p> <p>WS1.3e Interpret observations and other data.</p> <p>WS2b Make and record observations and measurements using a range of apparatus and methods.</p> <p>WS1.3a Present observations and other data using appropriate methods.</p> <p>WS1.3e Interpret observations and other data.</p> <p>WS2a Carry out experiments.</p> <p>WS1.3g Evaluate data in terms of accuracy, precision, repeatability, and reproducibility.</p> <p>WS1.3h Identify potential sources of random and systematic error.</p> <p>WS2a Carry out experiments.</p> <p>WS1.2a Use scientific theories and explanations to develop hypotheses.</p> <p>WS1.2b Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data, or explore phenomena.</p> <p>WS2b Make and record observations and measurements using a range of apparatus and methods.</p> <p>WS2c Present observations using appropriate methods.</p> <p>WS2d Communicate the scientific rationale for investigations, methods used, findings, and reasoned conclusions.</p>	
<p><b>Summer Term 3A Year 9</b></p>	<p><b>Intent</b> Why is this taught now?</p> <hr/> <p>P2.3 Continuing the work started in term 2B.</p>	<p>P2.3m Explain how levers and gears transmit the rotational effects of forces.</p> <p>M1c Use ratios, fractions, and percentages.</p> <p>P2.3n Recall that the pressure in fluids (gases and liquids) causes a net force at right angles to any surface.</p>	<p>Classwork and homework tasks.</p> <p>A formal unit test will be sat by all students toward the end of term 3A.</p>

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		<p>P2.3o Use the relationship between the force, the pressure, and the area in contact.</p> <p>PM2.3v Recall and apply: pressure (Pa) = force normal to a surface (N) / area of that surface (m<sup>2</sup>).</p> <p>M1c Use ratios, fractions, and percentages.</p> <p>WS1.1e Explain everyday and technological applications of science.</p> <p>WS1.1b Use models to solve problems, make predictions, and develop scientific explanations and understanding of familiar and unfamiliar facts.</p> <p>WS1.4a Use scientific vocabulary, terminology, and definitions.</p> <p>WS1.4e Interconvert units.</p>	
<p><b>Summer Term 3B Year 9</b></p>	<p><u><b>Intent</b></u> Why is this taught now?</p> <p>P1.1 Knowledge and understanding of the particle nature of matter is fundamental to physics. Learners need to have an appreciation of matter in its different forms, they must also be aware of subatomic particles, their relative charges, masses and positions inside the atom. The structure and nature of atoms are essential to the further understanding of physics. The knowledge of subatomic particles is needed to explain many phenomena, for example the transfer of charges, as well as radioactivity. This unit builds on learners knowledge from KS3 of the atomic model, and that atoms are examples of particles. They should also know the difference between atoms, molecules and compounds. Learners should understand how density can be affected by the state materials are in.</p>	<p>P1.1a Describe how and why the atomic model has changed over time.</p> <p>M5b Visualise and represent two-dimensional (2D) and three-dimensional (3D) forms, including 2D representations of 3D objects.</p> <p>P1.1b Describe the atom as a positively charged nucleus surrounded by negatively charged electrons, with the nuclear radius much smaller than that of the atom and with almost all of the mass in the nucleus.</p> <p>P1.1c Recall the typical size (order of magnitude) of atoms and small molecules.</p> <p>M1b Recognise and use expressions in standard form.</p> <p>WS1.1a Understand how scientific methods and theories develop over time.</p> <p>WS1.1b Use models to solve problems, make predictions, and develop scientific explanations and understanding of familiar and unfamiliar facts.</p> <p>WS1.3e Interpret observations and other data.</p> <p>WS1.4d Use prefixes and powers of ten for orders of magnitude.</p>	<p>Classwork and homework tasks.</p> <p>A formal end of year test will be sat by all students before the report date.</p>