



### Learning Aims and Curriculum Intent:

Students will build on the Physics covered in the Junior Science curriculum and further develop their skills as ‘physicists’.

Students will learn the fundamental ideas involved in space, forces, motion, waves, energy, magnetism, and matter. Content will be taken from the Edexcel iGCSE syllabus and is the starting point of a spiralling curriculum through Year 9, 10 and 11, where all these topics will be met again and again, building on these fundamental ideas.

Term	Content, Key Questions and Knowledge	Skills	Assessment
Michaelmas	<ul style="list-style-type: none"> <li>• <b>Space</b> <ul style="list-style-type: none"> <li>- Understanding our place in the universe, the nature of the universe, the objects within it and that gravity is the driving force behind their behaviour, such as their orbits.</li> <li>- Understanding that stars change over time - they are ‘born’, ‘live’ and ‘die’, that there are different types of stars, and that stars can be classified by their colour/temperature.</li> </ul> </li> <li>• <b>Forces</b> <ul style="list-style-type: none"> <li>- Understanding that forces are interactions between two objects, that there are different types of forces, such as weight and friction, contact and non-contact, and that forces, which are vectors, can be added together.</li> <li>- Understanding how to describe the motion of objects, what is meant by average and instantaneous speed (and velocity) and how to draw and interpret distance-time graphs.</li> <li>- Understanding that road safety – i.e., the stopping distance of a vehicle – depends on a number of factors relating to the driver, the vehicle, and the conditions.</li> </ul> </li> <li>• <b>Waves</b> <ul style="list-style-type: none"> <li>- Understand basic wave properties such as frequency, wavelength, speed, amplitude, time period, and that waves transfer information (but not matter) by oscillations. Understanding how transverse and longitudinal waves are different and similar, with examples of each.</li> <li>- Understanding how sound is produced and how it travels. Relating frequency and amplitude to the pitch and loudness of a sound wave and understanding that humans have a range of frequencies that they can normally hear.</li> <li>- Being able to use the wave equation and the relationship between frequency and time period.</li> <li>- To understand the nature of electromagnetic waves, to know their properties and the order of the electromagnetic spectrum, describing uses and dangers of each part of the spectrum.</li> </ul> </li> </ul>	<p>Mathematical</p> <ul style="list-style-type: none"> <li>- Graph plotting</li> <li>- Analysing d-t graphs</li> <li>- Using simple formulas (<math>f=1/T</math> and <math>v=f\lambda</math>) in calculations</li> <li>- Using powers of ten prefixes</li> <li>- Algebra, rearranging equations</li> </ul> <p>Practical</p> <ul style="list-style-type: none"> <li>- Planning speed of sound investigation</li> <li>- Measuring times and distances for moving objects and for speed of sound</li> </ul> <p>Problem solving</p> <ul style="list-style-type: none"> <li>- Analysing Hertzprung-Russell diagrams</li> <li>- Using Explicit Practice to analyse longer problems</li> </ul> <p>Research</p> <ul style="list-style-type: none"> <li>- Find out about different types of stars in the Milky Way</li> <li>- Find out about the uses and dangers of parts of the EM spectrum</li> </ul> <p>Technical literacy</p> <ul style="list-style-type: none"> <li>- Writing succinct explanations and descriptions</li> <li>- Using bullet points to write a logical progression of ideas</li> <li>- See key terminology</li> </ul>	<p>Summative</p> <ul style="list-style-type: none"> <li>- End of topic tests</li> </ul> <p>Explicit Practice</p> <ul style="list-style-type: none"> <li>- Assessment of decoding, retrieval, analysis and feedback in problem solving</li> </ul> <p>Mini quizzes</p> <ul style="list-style-type: none"> <li>- Low-stakes 10-mark multiple choice progress quizzes</li> </ul> <p>Mini tests at halfway point of each topic</p>
Lent	<ul style="list-style-type: none"> <li>• <b>Energy transfers</b> <ul style="list-style-type: none"> <li>- Understanding that energy is a quantity that is conserved but that can be transferred from one store to another, via some pathway or other.</li> <li>- Understanding how an energy transfer can be represented by a Sankey diagram and how this can indicate the efficiency of a process.</li> <li>- Understanding that thermal energy is transferred when there is a temperature difference (from a hotter to a colder body), that this can happen by conduction, convection and/or radiation, and how insulation can slow the rate of heat transfer.</li> </ul> </li> <li>• <b>Magnetism</b> <ul style="list-style-type: none"> <li>- Understanding what a magnetic field is, magnetic and non-magnetic materials, hard and soft magnetic materials, and how magnetism can be temporarily induced in magnetic materials.</li> <li>- Recognise and be able to draw magnetic field patterns for a range of fields, e.g., ‘single and pairs of bar magnets, current in wires, coils and solenoids.</li> <li>- Understand how electric current can be used in the construction of electromagnets, factors that affect the strength of an electromagnet, and uses of electromagnets such as the electric bell.</li> </ul> </li> </ul>	<p>Mathematical</p> <ul style="list-style-type: none"> <li>- Calculating efficiency</li> </ul> <p>Practical</p> <ul style="list-style-type: none"> <li>- Plotting magnetic field patterns</li> </ul> <p>Problem solving</p> <ul style="list-style-type: none"> <li>- Using Explicit Practice to analyse longer problems</li> </ul> <p>Research</p> <ul style="list-style-type: none"> <li>- Find out about energy transfers and global energy resources</li> </ul> <p>Technical literacy</p> <ul style="list-style-type: none"> <li>- Writing succinct description of how to demonstrate a magnetic field pattern</li> <li>- Using bullet points to write a logical progression of how an electric bell works</li> </ul>	<p>Summative</p> <ul style="list-style-type: none"> <li>- End of topic tests</li> </ul> <p>Explicit Practice</p> <ul style="list-style-type: none"> <li>- Assessment of decoding, retrieval, analysis and feedback in problem solving</li> </ul> <p>Mini-quizzes</p> <ul style="list-style-type: none"> <li>- Low-stakes 10-mark multiple choice progress quizzes</li> </ul> <p>Mini-tests at halfway point of each topic</p>

<b>Trinity</b>	<ul style="list-style-type: none"> <li>• <b>Matter</b></li> <li>- Understanding the concept of density and how to determine (by measurement and calculation) the density of different shapes and types of materials.</li> <li>- Understanding the concept of pressure on a surface and examples of when high or low pressure are desired or avoided. Understanding how pressure increases with depth in a fluid.</li> <li>- Understanding the particle nature of matter, the arrangement and behaviour of molecules in solids, liquids and gases, how gases exert pressure and why pressure depends on temperature.</li> </ul>	<p>Mathematical</p> <ul style="list-style-type: none"> <li>- Calculating pressure</li> </ul> <p>Practical</p> <ul style="list-style-type: none"> <li>- Measurements to determine density</li> </ul> <p>Problem solving</p> <ul style="list-style-type: none"> <li>- Using Explicit Practice to analyse longer problems</li> </ul> <p>Research</p> <ul style="list-style-type: none"> <li>- Brownian motion</li> </ul> <p>Technical literacy</p> <ul style="list-style-type: none"> <li>- Writing succinct explanation of how temperature affects pressure</li> </ul>	<p>Summative</p> <ul style="list-style-type: none"> <li>- End of topic tests</li> </ul> <p>Explicit Practice</p> <ul style="list-style-type: none"> <li>- Assessment of decoding, retrieval, analysis and feedback in problem solving</li> </ul> <p>Mini-quizzes</p> <ul style="list-style-type: none"> <li>- Low-stakes 10-mark multiple choice progress quizzes</li> </ul> <p>Mini-tests at halfway point of each topic</p>
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<b>Examples of Homework</b>	Isaac Physics questions, problem solving using explicit practice, revision for interleaved mini-tests, research and presentation on the life-cycles of stars.	
<b>Key terminology</b>	Universe, gravity, orbit, star, planet, moon, comet, solar system, temperature, weight, friction, contact, non-contact, vectors, average/instantaneous speed, velocity, stopping distance, frequency, wavelength, amplitude, time period, transverse, longitudinal, sound, pitch, loudness, wave equation, electromagnetic spectrum, energy conservation/transfer/stores, Sankey diagram, efficiency, thermal energy, conduction, convection, radiation, insulation, magnetic field, magnetic/non-magnetic/hard/soft magnetic materials, electromagnet, current, density, pressure, depth, fluid, particle nature of matter, molecules, solids, liquids, gases.	
<b>Super-curricular enrichment and scholarly extension</b>	<ul style="list-style-type: none"> <li>• <b>Read:</b> Astronomy: A Self-Teaching Guide by Dinah L. Moche Destination: Space by Seymour Simon Starfinder: The Complete Beginner's Guide to Exploring the Night Sky by Carole Stott The Astronaut Instruction Manual by Mike Mongo Forces and Motion: From High-speed Jets to Wind-up Toys by Tom DeRosa and Carolyn Reeves</li> <li>• <b>Watch:</b> Crashcourse physics <a href="https://youtu.be/OoO5d5P0Jn4">https://youtu.be/OoO5d5P0Jn4</a> Fuseschool stopping distances <a href="https://youtu.be/HTANxqGQcfl">https://youtu.be/HTANxqGQcfl</a></li> <li>• <b>Listen:</b> The infinite monkey cage <a href="https://www.bbc.co.uk/programmes/b00snr0w">https://www.bbc.co.uk/programmes/b00snr0w</a> Sound/echoes <a href="https://www.brainson.org/episode/2019/04/23/forever-echo-can-a-sound-wave-go-on-forever">https://www.brainson.org/episode/2019/04/23/forever-echo-can-a-sound-wave-go-on-forever</a> The brightest supernova: <a href="https://www.bbc.co.uk/programmes/w3ct4sc9">https://www.bbc.co.uk/programmes/w3ct4sc9</a></li> <li>• <b>Visit:</b> The Science Museum, London The Royal Observatory, Greenwich The National Space Centre, Leicester The RAF Museum, Hendon The Winchester Science Centre and Planetarium</li> </ul>	
<b>Useful websites</b>	Isaac Physics <a href="https://isaacphysics.org/">https://isaacphysics.org/</a> Khan Academy <a href="https://www.khanacademy.org/science/physics">https://www.khanacademy.org/science/physics</a> BBC Bitesize - Physics <a href="https://www.bbc.co.uk/bitesize/subjects/zrkw2hv">https://www.bbc.co.uk/bitesize/subjects/zrkw2hv</a> Physics Classroom <a href="https://www.physicsclassroom.com">https://www.physicsclassroom.com</a> S-cool - GCSE Physics <a href="https://www.s-cool.co.uk/gcse/physics">https://www.s-cool.co.uk/gcse/physics</a> Physics & Maths Tutor <a href="https://www.physicsandmathstutor.com/physics-revision">https://www.physicsandmathstutor.com/physics-revision</a>	
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