love the journey

Curriculum Implementation 2024-25

Secondary

LCA Strand	Science
Subject	**Physics**
Key Stage	**Key Stage 4**

What are the key concepts taught?	**Paper 1** – Energy, Electricity, Particle Model, Radioactivity **Paper 2** – Forces, Waves, Electromagnetism, Space (separate science only) **Maths skills** - algebra, data analysis, graph plotting, ratio, standard form, rounding **Practical skills** – risk assessment, carrying out practical work, planning and evaluating practical work, drawing conclusions, presenting data

What is the sequencing of units?	**Chapter 9** – In Chapter 9 we lay the foundations for the GCSE course. We teach the energy topic first, starting with the fundamental energy stores, followed by heat transfer and global energy resources which prepares pupils for the cross curricular links with geography later in the year, then more complicated energy equations once pupils have begun to extend their algebra skills in maths. We then cover a short topic on electrical circuits to bridge the gap between KS3 and GCSE, and electricity is returned to in more detail in Chapter 10. Both the energy and electricity topic support the development of mathematical skills especially use of equations early on in the course. These topics also highlight the importance of clear analytical thinking in physics e.g. drawing and using circuit diagrams. Chapter 9 finishes with an introduction to the waves topic which allows students to start developing more abstract models in their physics schema, and to have opportunities for successful practical work. **Separate Physics GCSE –** In Chapter 10, the pupils begin their GCSE courses. Separate physics pupils begin by completing the electricity topic in detail, which includes many of the required practicals in the course. They then build on their KS3 knowledge of the particle model to learn concepts such as density, specific heat capacity and the link between volume, temperature and pressure in gases. We then cover the majority of the GCSE

	waves topic, recapping the fundamentals from Chapter 9, and building on them to cover more specific types of waves such as seismic waves and the different parts of the electromagnetic spectrum. This topic enables pupils to link academic science to the real world they live in. The waves topic finishes with the uses of X-rays and gamma rays in medicine and therefore pupils are well prepared for the final Chapter 10 topic of atomic structure, radioactivity and nuclear power. In Chapter 11, we first complete the forces and motion topics which develop pupils' disciplinary knowledge by modelling mechanical systems and linking cause and effect, as well as drawing accurate scale diagrams. In this topic they learn and apply Newton's fundamental laws of motion, and use their mathematical skills to find gradients and areas from graphs and then explain the physical significance of the values they have calculated. We then cover the most challenging parts of the waves topic including refraction and lenses. The last two topics in Chapter 11 are electromagnetism and space physics which are challenging but rewarding topics to excite pupils as they begin to plan their next steps after GCSE. **Trilogy Physics (combined science GCSE) –** In Chapter 10, combined science pupils build on the basics of waves and complete the GCSE topic, including the parts of the electromagnetic spectrum. We then move on to look at the particle model in greater depth, building on the concepts that pupils started to develop in KS3. This topic highlights the importance of abstract 'models' that scientists use to explain experimental evidence. The last GCSE topic in Chapter 10 is electricity where we cover both electrical circuits and domestic wiring and appliances as well as the importance of the National Grid in the UK. We begin the forces topic just before summer as this is a challenging new way of thinking for many pupils, and this give us the opportunity to spend time teaching the fundamental concepts to avoid misconceptions later on. In Chapter 11 we move onto motion before linking force to acceleration and covering momentum and elasticity. The next topic is atomic structure and radioactivity, which develops pupils' previous substantive knowledge. Pupils find this topic fascinating perhaps because of the combined elements of the relatively recent physics and an awareness of the risks of the applications of the topic in energy, medicine and industry. We then finish the course with the basics of electromagnetism which covers the phenomena of magnetic fields and the principles of the motor effect. **ELC physics –** Where pupils study the Entry Level certificate alongside the Foundation tier GCSE, we follow an adapted curriculum through KS4. The focus is predominantly on practical skills and the concrete applications of science, but pupils will also cover the core substantive knowledge of the seven key physics topics as those studying combined science. Component 1 of the ELC covers energy, forces and atomic structure. Component 2 covers electricity, waves, electromagnetism and the particle model of matter. We adapt the content of these topics to continue on from KS3 learning in a more accessible format, and

	pupils also have the opportunity to carry out investigative coursework linked to each topic.

How do we encourage pupils to see the links between different units and concepts?	There are continual links back to **fundamentals** in physics through each subsequent topic e.g. energy stores, forces, atomic structure. **Spiralling** of the curriculum each year is a strength of our SOW e.g. electricity returned to in Chapter 10 to build on Chapter 9 content. **Questioning** (whole class and independent work) is present in all lessons which intentionally links topics where relevant. **Retrieval** tasks are planned to review linked content learnt previously to allow students to internalise the connections between the different topics and skills. **Cross curricular** links are explicitly made in lessons between physics topics and other science/maths/geography. Common content with chemistry and maths e.g. the development of the atomic model and data analysis skills are identified by teachers so that pupils can make those links in their schema and organise their knowledge effectively.

What are the planned opportunities for adaptive teaching, including for SEND, the more and able and disadvantaged pupils?	**ELC nurture group** taught concurrently with GCSE Foundation, with an adapted teaching order based on the ELC specification with extension into FT content through each year, and additional FT content introduced towards the end of Chapter 11. **Foundation and Higher Tier** classes follow the same teaching orders so that all students cover the same topics, but resources and questioning styles are adapted by class teachers based on the needs and ability of their class. Where FT and HT students are taught in the same class, additional support is provided where possible to allow this adaptive teaching to be enhanced accordingly.

What are the planned opportunities for retrieval and reflection by pupils?	Planned, targeted **retrieval starters** which return to previously learnt content at regular intervals, as well as **cumulative assessment** in both low stakes assessments and PP exams throughout the year. **Pre- and post-assessment** lessons are planned carefully to ensure a breadth of content is revised beforehand, and that pupils have the opportunity to reflect on their outcomes.

What are the opportunities for feed forward by the teacher post assessment outcomes?	Lessons set aside for **assessment review** and targeted questions based of students' individual errors and misconceptions. Students **reflect** on their assessment performance and set targets for their progress.

	Smaller **low-stakes assessment for learning** and mini-tests used frequently by class teachers to allow rapid feedback and feed forward to avoid misconceptions being embedded.

What are the planned opportunities for developing Reading?	**Reading lists** relevant to KS4 are shared with pupils, as well as suggestions shared with school library for new book purchases. In class, **reading aloud** is encouraged particularly for less confident readers, and where relevant teachers use **reading comprehension** activities and homework **research tasks** to develop pupils' ability to read and understand increasingly complex non-fiction texts.

What are the planned opportunities for developing literacy, numeracy, oracy and SMSC?	**Literacy –** Each key concept of the curriculum has topics which allow for knowledge of tier 2 and 3 vocabulary and literacy skills to be embedded in lessons throughout the course. Extended writing is planned within lessons and assessments e.g. students will be able to write cogently on the safety features of the UK domestic electricity supply, compare the properties of different states of matter and describe clearly how an investigation should be carried out. **Numeracy –** Numeracy is naturally woven into the majority of our physics curriculum with fundamental algebra, calculation and estimation skills being essential to the success of our pupils at GCSE. This is explicitly planned in the resources for each lesson and the teaching of numeracy is a core strength of all of our physics teachers. **Oracy –** Paired and group discussions to assist students to build their physics schema and articulate answers are present in many physics lessons, and where there are opportunities for more formal oracy tasks e.g. debate on the advantages and disadvantages of different energy resources this is capitalised upon. **SMSC –** Links to the role of science in society and industry, discussion of STEM career paths, representation of female and ethnically diverse scientists are present throughout the course. Exploration of the key turning points in the history of physics e.g. the discovery of infrared radiation, and opportunities for discussion are planned within the SOW. Our physics curriculum also aims to develop a proper understanding of hazards and risks where good scientific understanding will support pupils to make informed decisions e.g. vehicle stopping distances, the hazards of ultraviolet radiation, and safe working practices of NHS staff while taking X-rays are just a few examples of how we achieve this within our curriculum.