KS4 Curriculum Overview: Physics

Rationale:

In Key Stage 4 we continue to teach Physics separately to Biology and Chemistry. These divisions are mirrored further in the Sixth Form at Level 3, in the structure of both A level courses and units of the Vocational BTEC Level 3 National Extended Certificate in Applied Science.

In Years 10 and 11, we continue the work started in Year 9 as we build on the knowledge and understanding of Biology gained during Key Stage 3. This follows the philosophy of a '5 Year Key Stage 4' inherent in the current Programme of Study and National Curriculum for KS3 and 4 Science. (In other words, both the knowledge and skills directly gained at KS3 and those developed further during KS4 are tested during the GCSE exams taken at the end of Year 11).

At Key Stage 4 we follow the AQA Scheme of Learning, in common with Biology and Chemistry. All students in Years 10 and 11 follow the Combined Science Trilogy course, with 11A1, 11A2 and 11A3 being taught the Separate Science content in addition. Final decisions about the specific exam route taken are made in Year 11 on an individual basis.

In Year 10, students study Electricity, Advanced energy, Particle Model of Matter and Atomic Structure whilst in Year 11 finish with Waves, Electromagnetism and Space (Separate Science only). As far as is possible with separate topics, this sequence means that earlier material is revisited to support later material. Throughout the course, the scientific process is taught, with many opportunities to safely plan, risk assess, investigate, record, conclude and evaluate practical investigations, together with the relevant maths skills, and key subject-specific vocabulary that will enable students to be scientifically literate.

Reading in the Curriculum: The Sciences offer many opportunities to develop and extend students' literacy skills. Across the Physics curriculum students will explore new scientific vocabulary and will have the chance to deduce and perfect their own definitions of scientific keywords. Each unit includes a glossary which students will complete and learn during the unit. Literacy also appears in the investigations aspect of our curriculum as students must be able to read methods carefully in order to generate valid results. Students will use texts to find out information for themselves, using the functional layout of such texts, including index, contents and glossary sections of text books used in class, and also at home in an online format. Students also have access to dictionaries. There are also literacy activities where students must read samples of texts in order to extract the necessary information to answer questions. Students will also review and connect information within topics, so knowledge organisers are provided for each topic.

Connected Learning: Topics in the Sciences do not stand alone. Each topic connects to prior knowledge from primary school, other topics learnt or still to be learnt at this school both in the Sciences and in other subjects and also in the outside world. In KS4 a lot of the content directly builds upon their knowledge gained in KS3 Science. The Curriculum Plan has also been developed to coincide with content and skills learned in Mathematics and Design & Technology. This enables students to apply their knowledge across subjects and appreciate that Physics is not a standalone subject, rather it has applications across everyday life. Connected knowledge is discussed in class, starting with the Context Summary which is shared with students at the start of each topic.

Diversity: Science belongs to everyone, regardless of background, and people from all walks of life contribute to its development and reap its benefits. This is reflected in the examples used in lessons and the Scientists whose work we consider.
The school is particularly committed to promoting diversity in Physics. We will explore the input of physicists across a range of backgrounds to show that science is inclusive. The department is in partnership with the Institute of Physics to promote physics to girls and encourage them to consider physics-based careers. To do this we are adapting our language and approaches to activities to be more inclusive, and plan to run workshops and school trips.

1. *In the following Overview, the lesson numbers are approximate and will vary depending on the number of weeks in each term.*
2. *All in italic are for separate sciences only*
3. **All in bold are for higher tier only**

Term / Length of Unit	Outline	Assessment	Home Learning	Resources	Knowledge/Skills End Points	Literacy
Year 10 Autumn Term1 Chapter 2 Electricity 19 lessons + 2 x assessments and responding to feedback lessons	Chapter 2 Electricity Term 1 Students learn about static electricity and then link this to the flow of electricity in series and parallel circuits. Students also learn about how three-pin plugs work and the significance of the National Grid. There are ample opportunities to do a lot of investigative experiments.	Assessment – 'There are 3 summative Science tests through the year, please see the poster in the Science tab of the Y10 Blog for details. There are also a number of formative tests throughout the unit'.	Home learning – 'In the Sciences, Educake quizzes, based on current and previous topics, are set every Monday to be done by the following Monday in a Biology – Chemistry – Physics rotation. Further information is available in the Y10 Blog'.	SoL on science shared area, including powerpoints, details of practical investigations and associated risk assessments, worksheets, revision resources, homework booklet and test. Physics Student Book	Knowledge ● Describe how objects become electrically charged ● Describe the behaviour of electricity in series and parallel circuits ● Explain the behaviour different types of circuit components in circuits ● Understand the safety features of a three-pin plug ● Explain how electricity is transmitted along the National Grid Skills ● Investigating the IV characteristics of a diode, filament lamp and a fixed resistor ● Calculating resistance, power, charge and energy delivered to electric components ● Practise wiring up a three-pin plug	● Vocabulary and keywords defined and written in own words. Literacy activities that require and develop reading skills P2 Electricity Glossary
Year 10 Autumn Term1 Advanced Energy Electricity 10 lessons + assessment	Advanced Energy Term 1 **This topic is wholly focussed in ensuring that the numerical aspect of physics is addressed.** The aim is to make aware to students how to lay out calculations in a step-by-step manner. More importantly, students also learn how to link different equations together to arrive at a solution – a	Assessment – 'There are 3 summative Science tests through the year, please see the poster in the Science tab of the Y10 Blog for details. There are also a	Home learning – 'In the Sciences, Educake quizzes, based on current and previous topics, are set every Monday to be done by the following Monday in a Biology –	SoL on science shared area, including powerpoints, details of practical investigations and associated risk assessments, worksheets, revision resources, homework booklet and test. Physics Student Book	Knowledge ● Recalling the definitions of gravitational potential energy, kinetic energy and elastic potential energy ● Applying the Law of Conservation of Energy ● Recall the definitions to elastic deformation and inelastic deformation Skills	● P1 Advanced Energy Glossary

	skill normally tested in the external exams.	number of formative tests throughout the unit'.	Chemistry – Physics rotation. Further information is available in the Y10 Blog'.		• Calculating kinetic energy, gravitational potential energy and elastic potential energy • Re-arranging the formulae of kinetic energy, gravitational potential energy and elastic potential energy • Making links between various energy changes and calculating a variable • Executing an experiment linking force and extension • Determining the spring constant from a graph	
Year 10 Spring Term 2 Chapter 3 Particle Model of Matter 9 lessons + assessment	Chapter 3 Particle Model of Matter Term 2 Students make connections between Year 7 work on states of matter to more advanced work on specific heat capacity and specific latent heat.	Assessment – 'There are 3 summative Science tests through the year, please see the poster in the Science tab of the Y10 Blog for details. There are also a number of formative tests throughout the unit'.	Home learning – 'In the Sciences, Educake quizzes, based on current and previous topics, are set every Monday to be done by the following Monday in a Biology – Chemistry – Physics rotation. Further information is available in the Y10 Blog'.	SoL on science shared area, including powerpoints, details of practical investigations and associated risk assessments, worksheets, revision resources, homework booklet and test. Physics Student Book	Knowledge • Recall the changes in state • Recall the particle arrangement in various states of matter • Define and explain specific heat capacity • Define and explain specific latent heat Skills • Investigating the specific heat capacity lof different materials • Investigate the specific latent heat of water • Numerical calculations of specific heat capacity and specific latent heat	• P3 Glossary

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Year 10 Summer Term 3 Chapter 4 Atomic Structure 11 lessons	<u>Chapter 4 Atomic Structure Term 3</u> Students learn about the structure of the atom and how it links to different types of radioactive decay. **They also learn about how we use radiation in different ways along with the hazards linked to it** *and its uses in medicine. They then go on to learn about nuclear fission. and fusion* <u>N.B. Students do not get hands on experience in this topic due to the hazards, but will be able to observe a teacher-led demonstration of various radioactive samples.</u>	Assessment – 'There are 3 summative Science tests through the year, please see the poster in the Science tab of the Y10 Blog for details. There are also a number of formative tests throughout the unit'.	Home learning – 'In the Sciences, Educake quizzes, based on current and previous topics, are set every Monday to be done by the following Monday in a Biology – Chemistry – Physics rotation. Further information is available in the Y10 Blog'.	SoL on science shared area, including powerpoints, details of practical investigations and associated risk assessments, worksheets, revision resources, homework booklet and test. Physics Student Book	<u>Knowledge</u> ● Describe the structure of an atom and label the particles along with their charge and mass ● Learn how atoms can decay through alpha, beta or gamma decay and how this is calculated **along with background radiation** ● Students learn the equations and **link these to radioactive half life (a model using skittles/cubes can be used here to allow for practical work)** ● *Learn how irradiation causes ionisation and how this can be useful* ● *Know how radiation can be used with particular emphasis on medicine* ● *Understand the processes of nuclear fission and fusion* <u>Skills</u> ● Nuclear equations ● Calculating half life from a half life graph. 3. Due to the shortness of this topic there is time to develop the students appreciation of nuclear power stations and it can therefore be linked to Chapter 2 Electricity. Ensure to stress the relative safety of nuclear radiation to reduce the misconception that it is highly dangerous (students may relate this to The Simpsons and Chernobyl etc and not	● Vocabulary and keywords defined and written in own words. ● Literacy activities that require and develop reading skills ● <u>P4 Glossary</u>

					know the positive impact it has had on our development).	
Year 11 Autumn Term 1 Chapter 6 Waves 18 lessons	<u>Chapter 6 Waves Term 1</u> Students learn about the characteristics of waves that can be measured and **how these can be used to describe refraction and reflection of waves.** *How sound waves can be used to identify structures we cannot see.* Students also have hands-on experience of measuring wave characteristics through the Required Practical 6.5 (using a ripple tank and vibration generator) and *6.6 (Reflection and refraction of waves)*	Assessment – 'There are 3 summative Science tests through the year, please see the poster in the Science tab of the Y11 Blog for details. There are also a number of formative tests throughout the unit'.	Home learning – 'In the Sciences, Educake quizzes, based on current and previous topics, are set every Monday to be done by the following Monday in a Biology – Chemistry – Physics rotation. Further information is available in the Y11 Blog'.	SoL on science shared area, including powerpoints, details of practical investigations and associated risk assessments, worksheets, revision resources, homework booklet and test. Physics Student Book	<u>Knowledge</u> • What keywords are used to describe the characteristics of waves and identify longitudinal and transverse examples of waves. • Appreciate that waves transfer energy from one place to another and that the way they do this can be measured. • *Learn how sounds waves move and how they can be used to show us structures not visible to the naked eye.* <u>Skills</u> • Calculating speed, frequency and wavelength using the equation (data collected through the Required Practical 6.5) • *Graphical representation of sound waves and an oscilloscope* • Using and **rearranging equations**	• Vocabulary and keywords defined and written in own words. • Literacy activities that require and develop reading skills • <u>P6 Glossary</u>
Year 11 Autumn Term 1 Chapter 6 Waves 12 lessons (16 Separate) + 2x assessment and responding to feedback lessons	<u>Chapter 6 Waves Term 1</u> Students learn what ways other electromagnetic waves behave like light as well as if there are to her waves beyond the visible spectrum and **how waves can be**	Assessment – 'There are 3 summative Science tests through the year, please see the poster in the	Home learning – 'In the Sciences, Educake quizzes, based on current and previous topics, are set every Monday to	SoL on science shared area, including powerpoints, details of practical investigations and associated risk	<u>Knowledge</u> • Learn how earthquake waves can be used to identify the internal structure of the Earth • Link knowledge to the electromagnetic spectrum and apply knowledge of wavelength, frequency and amplitude to the spectrum.	• Vocabulary and keywords defined and written in own words. • Literacy activities that require and develop reading skills • <u>P6 Glossary</u>

	used to detect structures we cannot see. Students also have hands-on experience of investigating infrared radiation/absorption and using various lenses to make lens diagrams. This then links to the use of lenses in glasses/opticians use of them to determine our eyesight.	Science tab of the Y11 Blog for details. There are also a number of formative tests throughout the unit'.	be done by the following Monday in a Biology – Chemistry – Physics rotation. Further information is available in the Y11 Blog'.	assessments, worksheets, revision resources, homework booklet and test.	• Learn the order and characteristics of the waves in the spectrum. • *Learn about colour, images and how lenses work.* Skills • Investigating the amount of infrared absorbed/radiated by a surface • Using and **rearranging equations**		
Year 11 Autumn Term 1 Chapter 7 Electromagnetism 10 lessons	Chapter 7 Electromagnetism Term 1 Students learn in more detail about magnetism and electromagnetism, along with the history behind Michael Faraday's discovery. They will learn how we can use magnetic fields to produce electricity and relate this to power stations and *electromagnets.* Students also have hands-on experience of magnets and how to plot their fields as well as use them to make a motor work.	Assessment – 'There are 3 summative Science tests through the year, please see the poster in the Science tab of the Y11 Blog for details. There are also a number of formative tests throughout the unit'.	Home learning – 'In the Sciences, Educake quizzes, based on current and previous topics, are set every Monday to be done by the following Monday in a Biology – Chemistry – Physics rotation. Further information is available in the Y11 Blog'.	SoL on science shared area, including powerpoints, details of practical investigations and associated risk assessments, worksheets, revision resources, homework booklet and test. Physics Student Book	Knowledge • Describe a magnetic field and show how you can plot it. • Learn about solenoids and their uses. • Use their maths and equations to calculate the forces on conductors. • Appreciate how a motor works and link this to real life relevance. Skills • Fine motor skills for making the electric motor • Maths skills in equation use and **rearrangement**.	• P7 Electromagnetism Glossary	

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Year 11 Autumn Term 2 Chapter 7 Electromagnetism 10 lessons	*Chapter 7 Electromagnetism Term 2* *Students learn about how the motor effect and generator effect allow us to have and use motors and generators, along with loudspeakers. They will also learn how transformers are necessary in the National Grid.* *Students also have the opportunity to use transformers and look at an A Level PAG.*	Assessment – 'There are 3 summative Science tests through the year, please see the poster in the Science tab of the Y11 Blog for details. There are also a number of formative tests throughout the unit'.	Home learning – 'In the Sciences, Educake quizzes, based on current and previous topics, are set every Monday to be done by the following Monday in a Biology – Chemistry – Physics rotation. Further information is available in the Y11 Blog'.	SoL on science shared area, including powerpoints, details of practical investigations and associated risk assessments, worksheets, revision resources, homework booklet and test. Physics Student Book	*Knowledge* • *Understand how a loudspeaker works and be able to write this in extended writing questions.* • *Learn about the generator effect and compare it to the motor effect.* • **Make the link between electricity and magnetism.** • . Skills • *Extended writing task – loudspeakers* • **Rearranging equations**	• Vocabulary and keywords defined and written in own words. • Literacy activities that require and develop reading skills • P7 Electromagnetism Glossary
Year 11 Spring Term 1 Chapter 8 Space 5 lessons	*Chapter 8 Space Term 3 (SEPARATE ONLY)* *Students learn about the stars and what movements we can detect in space. Learn what our measurements tell us about the universe and what the role of gravity is in space physics. Students also have the opportunity to practice using standard form and scales.* COMBINED – REVISION Term 3 Revise all equations that students need to learn. Focus on exam technique e.g. show different marked answers to questions, get	Assessment – 'There are 3 summative Science tests through the year, please see the poster in the Science tab of the Y11 Blog for details. There are also a number of formative tests throughout the unit'.	Home learning – 'In the Sciences, Educake quizzes, based on current and previous topics, are set every Monday to be done by the following Monday in a Biology – Chemistry – Physics rotation. Further information is available in the Y11 Blog'.	*SoL on science shared area, including powerpoints, details of practical investigations and associated risk assessments, worksheets, revision resources, homework booklet and test. Physics Student Book*	*Knowledge* • *Label all parts of our Solar System, including the planets, Sun and satellites (natural and unnatural).* • *Learn about the characteristics and stages of different types of stars.* • *Link how the elements are formed to nuclear fusion from Chapter 4 Atomic Structure.* • *Describe Red Shift and explain why it shows us that the universe is still expanding.* *Skills* • *Use of enormous numbers and units and the ability to convert in to and out of standard form.* • *Use of scale.*	• Vocabulary and keywords defined and written in own words. • Literacy activities that require and develop reading skills • P8 Space Glossary

	students to mark answers etc. Walking Talking Mocks to help model exam techniques and discuss content.					