Year 13 Physics Sequence

	Content Taught	Reference	Essential Knowledge	Assessment	Rationale
YEAR 13					
HT1	**Thermal physics** The thermal physics topic allows the thermal properties of materials, the properties and nature of ideal gases, and the molecular kinetic theory to be studied in depth. **Gravitational fields** In this topic, pupils learn about Newton's law of gravitation, gravitational field	3.6.2.1 3.6.2.2 3.6.2.3 3.7.2.1 3.7.2.2 3.7.2.3 3.7.2.4	Thermal energy transfer Ideal gases Molecular kinetic theory ***Essential knowledge reading for consolidation:*** • ***Thermal physics - PMT*** • ***Thermal physics essential knowledge and practice booklet provided in class*** Newton's law of gravitation Gravitational field strength Gravitational potential Orbits of planets and satellites ***Essential knowledge reading for consolidation:***	**Formative Assessment:** Daily, Weekly and Monthly Reviews focussing on reviewing material on Essential Knowledge. Use of TLaC techniques in lessons to check pupil understanding of essential knowledge during each lesson. Pupils are challenged with application questions that 'bring the essential knowledge of the topic together.' **End of topic Summative Assessments:** In each topic of; thermal physics, gravitational fields, all pupils are assessed on the application of the essential knowledge that links ideas together throughout each topic.	In year 13, students utilise the essential knowledge from year 12 to complete 7 new units as well as the optional unit; astrophysics. Thermal physics builds upon essential knowledge taught in the KS4 topic – the particle model of matter. In the following 4 topics of 'fields,' many ideas from mechanics and electricity from earlier in the course support this and are further developed. The ideas of gravitation, electrostatics and magnetic field theory are developed within the topics to emphasise their unification. In the gravitational fields topic, students build upon essential knowledge of gravitational potential energy, force and weight from year 10 energy 3 and forces 3. This unit

	strength and potential and finish the topic learning about the orbits of planets and satellites.		• ***Fields and their consequences - PMT*** • ***Gravitational fields essential knowledge and practice booklet provided in class***		also provides essential knowledge for the subsequent topic of electric fields. Electric fields follow gravitational fields as the topics interlink closely in terms of concepts as well as providing the essential knowledge to apply to capacitance. Magnetic fields is the final fields topic and builds on essential knowledge from year 11 magnetism 3 as well as applying some concepts from gravitational and electric fields. Radioactivity build on essential knowledge from the particles 3 topic in year 10 where students are introduced to radioactivity. It also builds on the particle physics in year 12. This unit also provides essential knowledge for the nuclear physics topic that follows. We end the KS5 curriculum with an application of the measurements and errors topic that was first visited in year 12. This allows students to apply their essential disciplinary knowledge from the 12 required practicals delivered throughout the KS5 curriculum and bring it all together to
HT2	**Electric fields** Students study in depth how electric fields compare and contrast to gravitational field and study their applications. **Capacitance** This topic is an important application of electric fields. Students study in depth knowledge of the capacitors, such as how it stores charge and how this is	3.7.3.1 3.7.3.2 3.7.3.3 3.7.4.1 3.7.4.2 3.7.4.3 3.7.4.4	Coulombs law Electric field strength Electric potential ***Essential knowledge reading for consolidation:*** • ***Fields and their consequences - PMT*** • ***Electric fields essential knowledge and practice booklet provided in class*** Capacitance Parallel place capacitor Energy stored by a capacitor Capacitor charge and discharge ***Essential knowledge reading for consolidation:*** • ***Fields and their consequences - PMT*** • ***Capacitance essential knowledge and practice booklet provided in class***	**Formative Assessment:** Daily, Weekly and Monthly Reviews focussing on reviewing material on Essential Knowledge. Use of TLaC techniques in lessons to check pupil understanding of essential knowledge during each lesson. Pupils are challenged with application questions that 'bring the essential knowledge of the topic together.' **End of topic Summative Assessments:** In each topic of; electric fields, capacitance, magnetic fields, all pupils are assessed on the application of the essential knowledge that links ideas together throughout each topic.	

	applied in the modern world. **Magnetic fields** Students study how magnetic fields are generated and apply to different situations, including faraday's law and lens's law. Students finish the topic with magnetic applications of electricity.	3.7.5.1 3.7.5.2 3.7.5.3 3.7.5.4 3.7.5.5 3.7.5.6	Magnetic flux density Moving charges in a magnetic field Magnetic flux and flux linkage Electromagnetic induction Alternating currents Transformers ***Essential knowledge reading for consolidation:*** • ***Fields and their consequences - PMT*** • ***Magnetic fields essential knowledge and practice booklet provided in class***	**Cumulative assessment 4 – summative test** A cumulative and summative test taken in class and covers all topics studied up to this point. Topics covered: • All year 12 curriculum content • Thermal physics • Gravitational fields • Electric fields and capacitance • Magnetic fields Questions are a mix of recall and application questions to assess pupils understanding of essential knowledge up to this point	link substantive knowledge and disciplinary knowledge.
HT3	**Radioactivity** In this topic students go further in depth with their study of particles and radiation to link the properties of the nucleus, the characteristics of the nucleus and	3.8.1.1 3.8.1.2 3.8.1.3 3.8.1.4 3.8.1.5	Rutherford scattering Types of radiation Radioactive decay Nuclear instability Nuclear radius ***Essential knowledge reading for consolidation:*** • ***Nuclear physics - PMT*** • ***Radioactivity essential knowledge and practice booklet provided in class***	**Formative Assessment:** Daily, Weekly and Monthly Reviews focussing on reviewing material on Essential Knowledge. Use of TLaC techniques in lessons to check pupil understanding of essential knowledge during each lesson. Pupils are challenged with application questions that 'bring	

	the properties of unstable nuclei. **Telescopes and Classification of stars** Fundamental physical principles are applied to the study and interpretation of the Universe. Students gain deeper insight into the behaviour of objects at great distances from Earth and discover the ways in which information from these objects can be gathered. The underlying physical principles of the devices used are covered and some indication is given of the new information gained by the use	3.9.1.1 3.9.1.2 3.9.1.3 3.9.1.4 3.9.2.1 3.9.2.2 3.9.2.3 3.9.2.4 3.9.2.5 3.9.2.6	Astronomical telescopes Reflecting telescopes Single dish telescopes Advantages of large diameter telescopes ***Essential knowledge reading for consolidation:*** • ***Astrophysics - PMT*** • ***Telescopes essential knowledge and practice booklet provided in class*** Classification by luminosity Absolute magnitude, M Classification by temperature, black-body radiation stellar spectral classes The Hertzsprung-Russell (HR) diagram Supernovae, neutron stars and black holes ***Essential knowledge reading for consolidation:*** • ***Astrophysics - PMT*** • ***Classification of stars essential knowledge and practice booklet provided in class***	the essential knowledge of the topic together.' **End of topic Summative Assessments:** In each topic of; radioactivity, telescopes and classification of stars, all pupils are assessed on the application of the essential knowledge that links ideas together throughout each topic.	

	of radio astronomy.				
HT4	**Nuclear physics** Students study the production of nuclear power through the characteristics of the nucleus, the properties of unstable nuclei, and the link between energy and mass. Students become aware of the physics that underpins nuclear energy production and also of the impact that it can have on society. **Cosmology** Students gain essential knowledge of the	3.8.1.6 3.8.1.7 3.8.1.8 3.9.3.1 3.9.3.2 3.9.3.3 3.9.3.4	Mass and energy Induced fission Safety aspects ***Essential knowledge reading for consolidation:*** • ***Nuclear physics - PMT*** • ***Nuclear physics essential knowledge and practice booklet provided in class*** Doppler effect Hubbles law Quasars Detection of exoplanets	**Formative Assessment:** Daily, Weekly and Monthly Reviews focussing on reviewing material on Essential Knowledge. Use of TLaC techniques in lessons to check pupil understanding of essential knowledge during each lesson. Pupils are challenged with application questions that 'bring the essential knowledge of the topic together.' **End of topic Summative Assessments:** In each topic of; nuclear physics and cosmology, all pupils are assessed on the application of the essential knowledge that links ideas together throughout each topic. **Cumulative assessment 5 – summative test** A cumulative and summative test taken in class and covers all topics studied in the KS5 physics	

	Universe and how it began. Students will also study how technological advances have allowed for the discovery of exoplanets via new ways of gathering information by astonomers.		***Essential knowledge reading for consolidation:*** • ***Astrophysics - PMT*** • ***Cosmology essential knowledge and practice booklet provided in class***	curriculum. Questions are a mix of recall and application questions to assess pupils understanding of essential knowledge up to this point	
HT5	**Measurements and errors part 2** Students study how measurement techniques link to the required practicals that have taken place during the KS5 physics curriculum. This topic allows students to apply their essential disciplinary knowledge and bring together	3.1.1 3.1.2 3.1.3	Use of SI units and their prefixes Limitation of physical measurements Estimation of physical quantities ***Essential knowledge reading for consolidation:*** • ***Practical skills - PMT*** • ***Measurements and errors essential knowledge and practice booklet provided in class***	**Formative Assessment:** Daily, Weekly and Monthly Reviews focussing on reviewing material on Essential Knowledge. Use of TLaC techniques in lessons to check pupil understanding of essential knowledge during each lesson. Pupils are challenged with application questions that 'bring the essential knowledge of the topic together.' **End of topic Summative Assessments:** In the topic of measurements and their errors, all pupils are assessed	

	knowledge studied throughout year 12 and 13.			on the application of the essential knowledge that links ideas together from the required practicals throughout the entire course and apply this to measurement techniques and their errors.	
HT5 and HT6	Identification of strengths and weaknesses of the curriculum to plan re-teach and fill gaps.	All	Using question level analysis and data driven instruction, staff and pupils identify weaknesses in disciplinary knowledge (science skills) and substantive knowledge (topic content) and deliver re-teaching to improve overall essential knowledge of the KS5 physics curriculum.	Assessment is taken in class and covers all topics. Questions are a mix of recall and application questions to assess pupils understanding of essential knowledge covering the whole key stage 5 physics curriculum.	