Physics Knowledge Sequencing

By the end of key stage FOUR we want all students of Physics to know and do the following key things Hold Confident knowledge & understanding of key terms and concepts in Physics; apply to scenarios; make competent description; hold thorough practical skills; analyse qualitative & quantitative data with reasoning; manipulate of data; draw coherent conclusions; make well-reasoned judgements; evaluate practical procedure with growing independence, link key concepts

Prior Knowledge	In KS4, students of Physics will build on the following prior learning: KS3 knowledge and understanding, ability to think scientifically, appreciation of key practical methods; awareness of variables; KS3 mathematical skills, awareness of the purpose of evaluation; justified conclusion; analysis of data with description of trends; key apparatus and techniques; appreciation of lab safety and safe use of experimental equipment
Future Knowledge	The Curriculum in KS4 Physics will prepare students for the following future learning: Confident knowledge & GCSE understanding; application to wider scenarios, such as energy and energy resources; particles at work, forces in action, waves, electromagnetism and space; manipulation of data; coherent conclusions; well-reasoned judgements; evaluate & refine practical procedure independently, link key concepts.

	Term	Key Knowledge	Assessment Focus
Year 10	1	Describe density as a property of a material and not a particular object. Calculate the volume of some regular shapes and the density of materials, with support. Outline the behaviour of particles in solids, liquids, and gases. Describe pressure as being caused by collisions of gas particles with the walls of its container. State that the temperature of a gas is related to the kinetic energy of the gas particles.	End of topic assessment on molecules and matter Methods of practically measuring density core practical
	2	Name the three types of nuclear radiation the three sub-atomic particles found in an atom (proton, neutron, and electron) and identify some sources of background radiation. Identify the Rutherford (nuclear) model of an atom. Identify the type of decay taking place from a nuclear equation. State that all three types of nuclear radiation are ionising. Define half-life in simple terms such as 'the time it takes for half of the material to decay'	Properties of radiation Radioactivity end of topic assessment
	3	Recognise contact and non-contact forces. Recognise vector and scalar quantities. What a resultant force is and how to calculate it. Explain examples of levers in everyday life. What "the principle of moments" is and how to calculate if moments are balanced. State that gear systems can be used to increase or decrease the size of forces.	Forces in balance end of topic assessment Resultant force calculation
	4	State that the gradient of a distance-time graph represents the speed. Estimate typical speeds for walking, running, and cycling. Describe the difference between speed and velocity using an appropriate example. Measure the acceleration of an object as it moves down a ramp. Identify changes in speed on a distance-time graph using change in gradient.	Motion end of topic assessment Year 10 assessment
	5	State the factors that will affect the acceleration of an object acted on by a resultant force. Calculate the force required to cause a specified acceleration on a given mass. Investigate a factor that affects the acceleration of a mass. State the difference between the mass of an object and its weight. State factors which affect the stopping distance of a car. State Hooke's law.	Hooke's law practical data analysis Forces and motion end of topic assessment
	6	State the factors that affect the pressure acting on a surface. Calculate the pressure caused by an object resting on a surface, given the force and area of contact. State that pressure can be caused by the action of fluids (liquids and gases) on a surface. Describe the cause of atmospheric pressure in simple terms.	Forces and pressure end of topic assessment

	Term	**Key Knowledge**	
Year 11	1	State examples of both transverse and longitudinal waves. Describe the range of human hearing. Explain the similarities and differences between sound waves and ultrasound waves. Describe practical applications for ultrasound waves. State advantages and disadvantages of using ultrasound waves for diagnosis. Describe that P-waves and S-waves are types of seismic wave.	Planning practical to measure the wavelength of a wave Wave properties end of topic assessment
	2	Describe that electromagnetic waves transfer energy from one place to an absorber of that energy. State the seven types of electromagnetic wave, in the correct order from longest to shortest wavelength. Explain that the only part of the electromagnetic spectrum that our eyes can detect is visible light. Describe transparent and translucent. Describe situations where real images and virtual images are produced.	Year 11 mock assessment Required practical on absorption and emission of infrared Electromagnetic spectrum and light assessment
	3	Use the 'right hand thumb rule' to draw the magnetic field pattern of a wire carrying an electric current. Draw the magnetic field pattern for a straight wire carrying a current and for a solenoid. Interpret graphs of potential difference generated in the coil against time. Explain the function and operation of the a.c. and d.c. generators. Draw the magnetic field pattern of a bar magnet and describe how to plot the magnetic field pattern using a compass.	Electromagnetism assessment
	4	Draw and explain using a diagram the forces acting on a satellite in orbit around the Earth. Describe that there is still much about the universe that is not understood, for example dark mass and dark energy. Describe the name of the element that makes up most of the mass of a star and how these are formed during the stars life cycle.	Space assessment
	5	Consolidation of prior learning and application to exam questions in preparation for external exams through use of past paper questions.	External examinations
	6		

Opportunities for developing literacy skills and developing learner confidence and enjoyment in reading	**Links to British Values**	**Links to Careers**	**Links to Other Personal Development**
FROM THE LIBRARY *Solids Liquids and Gasses*-530.4 *Dictionary Of Physics-530.03*	**Mutual respect:** Debates about ethical and moral issues, such as how we should generate electricity in the future, the big bang	Links to a broad range of careers are made at the start of each new topic area. They are given to students on their learning objectives sheets and projected on the	• Developing a healthy lifestyle. • Developing healthy relationships. • Develop a set of positive personal traits,

Changing Materials-530.4 *Complete Physics-530* *Radiation*-539 *Nuclear Energy*-620 *Elements of Nuclear Physics*-539.1 *Introduction to Atomic and Nuclear Physics-539* *Big Idea: Einstein and Relativity*-509 *Fatal Forces*-500 *Forces and Motion*-531 *Forces and Movement*-531 *Designs in Science:Movement-530*	**Rule of law:** When conducting practical work, we have to follow rules about Health and Safety to ensure the safety of everyone in the laboratory. When using radioactive sources, certain members of the department are trained as Radiation Protection Supervisors to comply with Health and Safety laws. **Tolerance:** Throughout the Science curriculum, scientists from different backgrounds will be discussed, including the challenges they faced because of their beliefs, viewpoints and protected characteristics. When discussing contentious issues, for example theories about the formation of the Universe, all viewpoints are considered while teaching the scientifically accepted ideas. Debates about ethical and moral issues, such as whether we should test drugs on animals, or whether nuclear bombs should be developed. All students are able to share their viewpoints.	introductory slide of each new topic.	dispositions and virtues that informs their motivation and guides their conduct so that they reflect wisely, learn eagerly, behave with integrity and cooperate consistently well with others. • Develop confidence, resilience and knowledge so that they can keep themselves mentally healthy. • An inclusive environment that meets the needs of all pupils, irrespective of age, disability, gender reassignment, race, religion or belief, sex or sexual orientation.

	Democracy: Science is a democratic discipline. When developing new theories, it has to be accepted by a wide number of scientists before it is consider a scientific theory. Similarly, all experimental work has to be peer reviewed by others before it is accepted. **Individual liberty:** Students have opportunities that will allow them to use their knowledge and understanding to pose scientific questions and define scientific problems. Students are introduced to the idea that Science cannot provide the answers to some questions, for example, where beliefs, opinions and ethics are important.		

Extra-Curricular and Co-Curricular Opportunities	**Links with other subjects in the curriculum**
Lego league Rotary tech challenge Arkwright scholarship Nancy Rothwell award competition	Maths - classifying, counting, measuring, calculating, estimating, tables, graphs, statistics, algebra Geography – Seismic waves. History – structure of the atom. Design and technology – .

Science week activities and poster competition. Kerboodle – additional resources and textbooks Educake	Personal development – social and cultural contributions of scientists such ???????. English and MFL: etymology of words

Physics Knowledge Sequencing

By the end of key stage FIVE we want all students of Physics to know and do the following key things: Have confident knowledge, understanding, and application of core Physics terms and concepts; give depth of description; hold high competency for practical skills; analyse and manipulate qualitative & quantitative data with reasoning; draw coherent conclusions; make well-reasoned judgements; evaluate & refine practical procedure independently.

Prior Knowledge	In KS5, students of Physics will build on the following prior learning: GCSE knowledge and understanding of topics such as Mechanics, Materials, Electric Circuits, Waves, Further Mechanics, Field Theory, Nuclear and Particle Physics, Thermodynamics, Nuclear Radiation and Space; build on experience of practical procedures; justification of processes and variables; GCSE mathematical skills, including evaluation of data; offer extended responses, justified conclusion, and explanations of trends; key apparatus and techniques; appreciation of laboratory safety and safe use of practical equipment.
Future Knowledge	The Curriculum in KS5 Physics will prepare students for the following future learning: Undergraduate study in areas such as Medicine, Physics, Engineering and Finance; understanding beyond specification; appreciation of wider reading and linked theory; independent research skills; independent practical investigation; collection and manipulation of quantitative data.

	Term	**Key Knowledge**	**Assessment Focus**
Year 12	1	Understand and apply knowledge to the mechanics of force and motion. Understand and describe the properties of fluid materials.	Common practical assessments Force assessment Motion assessment Fluid material assessment
	2	Understand and apply knowledge to systems involving changes in energy, momentum, and solid materials.	Y12 assessment Solid materials assessment Energy assessment Momentum assessment
	3	Develop models of and apply knowledge of electrical quantities and wave properties.	Electrical quantities assessment Wave properties assessment
	4	Apply ideas of electrical quantities to DC circuits. Apply ideas of wave properties to optical systems.	Electric circuits assessment Optics assessment
	5	Extend the concepts of linear motion to systems undergoing rotation through circular motion. Understand the concept of quantum physics and how the concept was first established.	Y12 interim examinations Circular motion assessment Quantum physics assessment
	6	Understand and apply ideas about the development of the atomic and subatomic models. Describe and apply mathematical analysis of particle accelerators. Extend and apply the concept of electric fields to capacitors.	Y12 interim examinations Particle accelerator assessment Capacitor assessment
Year 13	Term	**Key Knowledge**	

	1	Develop an understanding of subatomic particle physics and used the concepts to make predictions. Understand and apply knowledge of magnetic fields.	Particle physics assessment Magnetic fields assessment
	2	Extend understanding of nuclear radiation and apply the concepts of mad defect calculations. Apply the concept of field theory to gravitational fields.	Y13 assessment. Nuclear radiation assessment Gravitational fields assessment
	3	Further develop the concepts of measuring the size of the universe and understanding out place within it. Understand and develop the laws of thermodynamics	Y13 assessment. Space assessment Thermodynamics assessment
	4	Understand and apply knowledge of simple harmonic motion. Consolidation of prior learning in preparation for mock examinations. Calculations and practical work involving electrode potentials and redox titrations. Practical Activity Nine: investigate how pH changes and Practical Activity eleven: identifying transition metal ions.	Simple harmonic motion assessment
	5	Consolidation of prior learning and application to unfamiliar scenarios in preparation for external exams through use of past paper questions.	External Examinations
	6		

Opportunities for developing literacy skills and developing learner confidence and enjoyment in reading	Links to British Values	Links to Careers	Links to Other Personal Development
Books The Pleasure of Finding Things Out - Richard Feynman Magazine/Journals Scientific American New Scientist	**Mutual respect:** Debates about ethical and moral issues, such as whether we should test drugs on animals, or whether nuclear bombs should be developed. All students are able to share their viewpoints respectfully. **Rule of law:** When conducting practical work, we have to follow rules about Health and Safety to ensure the safety of everyone in the laboratory.	• Higher education opportunities signposted in lessons, on Teams and permanent displays. • Pupils are regularly supported and provided with guidance on necessary grades required for University courses and subsequent careers.	• Developing a healthy lifestyle. • Developing healthy relationships. • Develop a set of positive personal traits, dispositions and virtues that informs their motivation and guides their conduct so that they reflect wisely, learn eagerly, behave with integrity and cooperate consistently well with others.

	When conducting experiments involving animals, we have to abide by laws to ensure that animals are not treated cruelly. When using radioactive sources, certain members of the department are trained as Radiation Protection Supervisors to comply with Health and Safety laws. **Tolerance:** Throughout the Science curriculum, scientists from different backgrounds will be discussed, including the challenges they faced because of their beliefs, viewpoints and protected characteristics. When discussing contentious issues, for example theories about the formation of the Universe, all viewpoints are considered while teaching the scientifically accepted ideas. Debates about ethical and moral issues, such as whether we should test drugs on animals, or whether nuclear bombs should be developed. All students are able to share their viewpoints. **Democracy:** Science is a democratic discipline. When developing new theories, it		• Develop confidence, resilience and knowledge so that they can keep themselves mentally healthy. • An inclusive environment that meets the needs of all pupils, irrespective of age, disability, gender reassignment, race, religion or belief, sex or sexual orientation.

	has to be accepted by a wide number of scientists before it is consider a scientific theory. Similarly, all experimental work has to be peer reviewed by others before it is accepted. **Individual liberty:** Students have opportunities that will allow them to use their knowledge and understanding to pose scientific questions and define scientific problems. Students are introduced to the idea that Science cannot provide the answers to some questions, for example, where beliefs, opinions and ethics are important.		

Extra-Curricular and Co-Curricular Opportunities	**Links with other subjects in the curriculum**
Lego league Rotary tech challenge Arkwright scholarship Nancy Rothwell award competition Science week activities and poster competition. Kerboodle – additional resources and textbooks	Maths - classifying, counting, measuring, calculating, estimating, tables, graphs, statistics, algebra History – structure of the atom and particle physics Design and technology –properties of metals and metal alloys. Personal development – social and cultural contributions of scientists such as Hubble. English and MFL: etymology of words