West Kirby Grammar School

Curriculum Map – Year 11 – Physics (2024-25)

Topic name	Term	Skills developed	Link to subject content	Prior learning	Next link in curriculum
1. Electricity	Spring	• Recognise and use expressions in decimal form • Recognise and use expressions in standard form • Use ratios, fractions and percentages • Change the subject of an equation • Substitute numerical values into algebraic equations using appropriate units for physical quantities • use a variety of models to solve problems, make predictions and to develop scientific explanations and understanding. • Explain everyday and technological applications of science; evaluate associated personal, social, economic and environmental implications; and make decisions based on the evaluation of evidence and arguments. • Evaluate risks both in practical science and the wider societal context, including perception of risk in relation to data and consequences.	AQA 4.2 Electricity and RP 3 and 4 • Current, potential difference and resistance • Investigating factors affecting resistance • IV characteristics • Series and parallel circuits • Charge, current, time, Q=It • Potential difference and energy, E=QV • Resistance, R=V/I • Direct and alternating potential difference: Students should be able to explain the difference between direct and alternating potential difference. • Mains electricity: Students should be able to explain that a live wire may be dangerous even when a switch in the mains circuit is open, the dangers of providing any connection between the live wire and earth. • Power and energy: Students should be able to explain how the power transfer in any circuit device is related to the potential difference across it and the current through it, and to the energy changes over time. • Energy transfers in everyday appliances: Students should be able to describe how different domestic		

		•	appliances transfer energy from batteries or ac mains to the kinetic energy of electric motors or the energy of heating devices. Students should be able to explain how the power of a circuit device is related to the potential difference across it and the current through it, the energy transferred over a given time. Students should be able to describe, with examples, the relationship between the power ratings for domestic electrical appliances and the changes in stored energy when they are in use. • National grid: Students should be able to explain why the National Grid system is an efficient way to transfer energy. • REQUIRED PRACTICAL 3: Use circuit diagrams to set up and check appropriate circuits to investigate the factors affecting the resistance of electrical circuits. This should include: • the length of a wire at constant temperature • combinations of resistors in series and parallel. AT 1, 6 and 7. REQUIRED PRACTICAL 4: use circuit diagrams to construct appropriate circuits to investigate the I–V characteristics of a variety of circuit elements, including a filament lamp, a diode and a resistor at constant temperature.AT 6 and 7.		

2. Elasticity	Summer		4.1.1.2 changes in energy – elastic potential energy 4.5.3 Forces and elasticity • Forces: associated with deforming objects; stretching and squashing – springs; Hooke's Law as a special case • Work done and energy changes on deformation • Measurements of stretch or compression as force is changed • Force-extension linear relation; Hooke's Law as a special case • Moment as the turning effect of a force • Simple machines give bigger force but at the expense of smaller movement (and vice versa): product of force and displacement unchanged • REQUIRED PRACTICAL 6: investigate the relationship between force and extension for a spring. AT 1 and 2.	Links from KS3: Particles unit in year 7 chemistry Links from KS4: GCSE Chemistry C4.1 Atomic Structure in year 9	Links to GCSE Fission and fusion. Autumn Year 11 Links to GCSE Space Spring Year 11 Links to AS/A2 Particles and radiation Summer Year 12
3. Atomic Structure	Year 11 autumn	• Understand how scientific methods and theories develop over time. • Use a variety of models such as representational, spatial, descriptive, computational and	AQA 4.4 Atomic structure 4.4.1 Atoms and isotopes 4.4.2 Atoms and nuclear radiation	Links from KS3: Energy unit in Year 7 Links with KS4:	Links to GCSE Magnetism and electromagnetism

		mathematical to solve problems, make predictions and to develop scientific explanations and understanding of familiar and unfamiliar facts. • Explain everyday and technological applications of science; evaluate associated personal, social, economic and environmental implications; and make decisions based on the evaluation of evidence and arguments. • Evaluate risks both in practical science and the wider societal context, including perception of risk in relation to data and consequences. • Recognise the importance of peer review of results and of communicating results to a range of audiences. • Use scientific vocabulary, terminology and definitions. • Use prefixes and powers of ten for orders of magnitude (eg tera, giga, mega, kilo, centi, milli, micro and nano). • Recognise and use expressions in standard form	• The structure of the atom: Students should be able to describe the basic structure of an atom. • Mass number, atomic number and isotopes: Students should be able to relate differences between isotopes to differences in conventional representations of their identities, charges and masses. • The development of the model of the atom: Students should be able to describe why the new evidence from the scattering experiment led to a change in the atomic model and the difference between the plum pudding model of the atom and the nuclear model of the atom. • Radioactive decay and nuclear radiation: Students should be able to apply their knowledge to the uses of radiation and evaluate the best sources of radiation to use in a given situation. • Nuclear equations: Students should be able to use the names and symbols of common nuclei and particles to write balanced equations that show single alpha (α) and beta (β) decay. • Half-lives and the random nature of radioactive decay: Students should be able to explain the concept of half-life and how it is related to the random nature of radioactive decay. Students should also be able to determine the	Energy stores and transformations early in year 10.	Spring Year 11 Links to AS/A2 Electricity Autumn Year 12

		• Use ratios, fractions and percentages • Substitute numerical values into algebraic equations using appropriate units for physical quantities • Solve simple algebraic equations • Translate information between graphical and numeric form	half-life of a radioactive isotope from given information and be able to calculate the net decline, expressed as a ratio, in a radioactive emission after a given number of half-lives. • Radioactive contamination: Students should be able to compare the hazards associated with contamination and irradiation. Students should understand that it is important for the findings of studies into the effects of radiation on humans to be published and shared with other scientists so that the findings can be checked by peer review. • Hazards and uses of radioactive emissions and of background radiation: Students should be able to describe background radiation and explain why the hazards associated with radioactive material differ according to the type or radiation and the half-life involved. • Uses of nuclear radiation: Students should be able to describe and evaluate the uses of nuclear radiations for exploration of internal organs, and for control or destruction of unwanted tissue and evaluate the perceived risks of using nuclear radiations in relation to given data and consequences.		

4. Energy Resources	Year 11 autumn	• Appreciate the power and limitations of science and consider any ethical issues which may arise. • Explain everyday and technological applications of science; evaluate associated personal, social, economic and environmental implications; and make decisions based on the evaluation of evidence and arguments. • Interpreting observations and other data (presented in verbal, diagrammatic, graphical, symbolic or numerical form), including identifying patterns and trends, making inferences and drawing conclusions • Use prefixes and powers of ten for orders of magnitude (eg tera, giga, mega, kilo, centi, milli, micro and nano). • Use ratios, fractions and percentages • Construct and interpret frequency tables and diagrams, bar charts and histograms • Translate information between graphical and numeric form •	AQA 4.1.3 National and global energy resources. • #Students should be able to: • describe the main energy sources available • Distinguish between energy resources that are renewable and energy resources that are non-renewable, • Compare ways that different energy resources are used and understand why some energy resources are more reliable than others. • Describe the environmental impact arising from the use of different energy resources and explain patterns and trends in the use of energy resources. Students should also be able to: Consider the environmental issues that may arise from the use of different energy resources and show that science has the ability to identify environmental issues arising from the use of energy resources but not always the power to deal with the issues because of political, social, ethical or economic considerations.		

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5 Forces 4.5.7 Momentum (HT only)	Autumn	WS 1.2 MS 3b, c Students should be able to recall and apply this equation. AT 1, 2, 3 Investigate collisions between laboratory trollies using light gates, data loggers or ticker timers to measure and record data WS 1.2, 4 MS 3b, 3c, 3d	4.5.7 Momentum (HT only) 4.5.7.1 Momentum is a property of moving objects 1. Momentum is defined by the equation: momentum = mass × velocity $p = m\,v$ 4.5.7.2 Conservation of momentum 1. In a closed system, the total momentum before an event is equal to the total momentum after the event. This is called conservation of momentum. 2. complete calculations involving an event, such as the collision of two objects.		
6 Magnetism and electromagnetism 4.7.1 Permanent and induced magnetism, magnetic forces and fields	Spring		4.7.1.1 Poles of a magnet 1. the attraction and repulsion between unlike and like poles for permanent magnets 2. the difference between permanent and induced magnets. 4.7.1.2 Magnetic fields 1. describe how to plot the magnetic field pattern of a magnet using a compass 2. draw the magnetic field pattern of a bar magnet showing how strength and direction change from one point to another	Links from KS2: P3.2 Forces and magnets 1. observe how magnets attract or repel each other and attract some materials and not others 2. compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and	Year 13 A level Physics (AQA) 3.7 Fields and their consequences 3.7.5 Magnetic fields 3.7.5.1 Magnetic flux density

			explain how the behaviour of a magnetic compass is related to evidence that the core of the Earth must be magnetic.	identify some magnetic materials 3. describe magnets as having two poles 4. predict whether two magnets will attract or repel each other, depending on which poles are facing.	
6 Magnetism and electromagnetism 4.7.2 The motor effect 4.7.2.1 Electromagnetism 4.7.2.2 Fleming's left-hand rule (HT only) 4.7.2.3 Electric motors (HT only) 4.7.2.4 Loudspeakers (HT only)	Spring	WS 2.2 WS 1.4	4.7.2.1 Electromagnetism 1. describe how the magnetic effect of a current can be demonstrated 2. draw the magnetic field pattern for a straight wire carrying a current and for a solenoid (showing the direction of the field) 3. explain how a solenoid arrangement can increase the magnetic effect of the current. 4. Students should be able to interpret diagrams of electromagnetic devices in order to explain how they work. 4.7.2.2 Fleming's left-hand rule (HT only) 1. When a conductor carrying a current is placed in a magnetic field the magnet producing the field and the conductor exert a force on each other. This is called the motor effect. 2. Students should be able to show that Fleming's left-hand rule represents the relative orientation of the force, the current in the conductor and the magnetic field. 3. Students should be able to recall the factors that affect the size of the force on the conductor.		Year 13 A level Physics (AQA) 3.7 Fields and their consequences 3.7.5 Magnetic fields 3.7.5.2 Moving charges in a magnetic field 3.7.5.3 Magnetic flux and flux linkage

			4. For a conductor at right angles to a magnetic field and carrying a current: force = magnetic f lux density × current × length 4.7.2.3 Electric motors (HT only) 1. Students should be able to explain how the force on a conductor in a magnetic field causes the rotation of the coil in an electric motor.		