West Kirby Grammar School

Curriculum Map – Year 12 – Physics Teacher 1 (2026-27)

Topic name	Term	Skills developed	Link to NC subject content and beyond	Prior learning	Next link in curriculum
2.1 Physical quantities and units	Autumn	M0.1 - Recognise and make use of appropriate units in calculations M0.4 - Estimate results HSW8 - Communicate information and ideas in appropriate ways using appropriate terminology	**2.1.1 Physical quantities** – physical quantities have a numerical value and a unit – making estimates of physical quantities listed in this specification. **2.1.2 S.I. units** – Système Internationale (S.I.) base quantities and their units – mass (kg), length (m), time (s), current (A), temperature (K), amount of substance (mol) – (b) derived units of S.I. base units Examples: momentum kg m s–1 and density kg m–3 – units listed in this specification – checking the homogeneity of physical equations using S.I. base units – prefixes and their symbols to indicate decimal submultiples or multiples of units – pico (p), nano (n), micro (μ), milli (m), centi (c), deci (d), kilo (k), mega (M), giga (G), tera (T) – the conventions used for labelling graph axes and table columns.	Links to all required practicals at GCSE.	Content in this section is a continuing study for a student of physics. A working knowledge of the specified fundamental (base) units of measurement is vital. The ability to carry through reasonable estimations is a skill that is required throughout the course and beyond.
2.2 Making measurements and analysing data	Autumn	M1.5 - Identify uncertainties in measurements and use simple techniques to determine uncertainty when data are combined by addition, subtraction, multiplication, division and raising to powers	**2.2.1 Measurements and uncertainties** – systematic errors (including zero errors) and random errors in measurements – precision and accuracy – absolute and percentage uncertainties when data are combined by addition, subtraction, multiplication, division and raising to powers – graphical treatment of errors and uncertainties; line of best fit; worst line;	Links to all required practicals at GCSE.	Content in this section is a continuing study for a student of physics. A working knowledge of the specified fundamental (base) units of measurement is vital. The ability to carry through reasonable estimations is a skill that is required

		HSW5 - Analyse and interpret data to provide evidence, recognising correlations and causal relationships	absolute and percentage uncertainties; percentage difference.		throughout the course and beyond.
4.1 Charge and current	Autumn	HSW7 - Know that scientific knowledge and understanding develops over time M0.2 - Recognise and use expressions in decimal and standard form HSW1 - Use theories, models and ideas to develop scientific explanations HSW2 - Use knowledge and understanding to pose scientific questions, define scientific problems, present scientific arguments and scientific ideas	**4.1.1 Charge** – electric current as rate of flow of charge – the coulomb as the unit of charge – the elementary charge e – net charge on a particle or an object is quantised and a multiple of e – current as the movement of electrons in metals and movement of ions in electrolytes – conventional current and electron flow – Kirchhoff's first law; conservation of charge. **4.1.2 Mean drift velocity** – mean drift velocity of charge carriers – I = Anev, where n is the number density of charge carriers – distinction between conductors, semiconductors and insulators in terms of n.	KS3 Electric circuits Year 10 (Combined and separate) – Electric circuits – Mains electricity	Year 13 (Capacitors) – Capacitors – Energy – charging and discharging Year 13 (Electric Fields) – Point and spherical charges – Coulomb's law – Uniform electric fields – Electric potential and energy
4.2 Energy, power and resistance	Autumn	M3.12 - Sketch mathematical relationships HSW5 - Analyse and interpret data to provide evidence, recognising correlations and causal relationships	**4.2.1 Circuit symbols** – circuit symbols – circuit diagrams using these symbols. **4.2.2 E.m.f. and p.d** – potential difference (p.d.); the unit volt – electromotive force (e.m.f.) of a source such as a cell or a power supply – distinction between e.m.f. and p.d. in terms of energy transfer (d) energy transfer; W = VQ; W = EQ	KS3 Electric circuits Year 10 (Combined and separate) – Electric circuits – Mains electricity	Year 13 (Capacitors) – Capacitors – Energy – charging and discharging Year 13 (Electric Fields) – Point and spherical charges – Coulomb's law

		HSW8 - Communicate information and ideas in appropriate ways using appropriate terminology HSW9 - Consider applications and implications of science and evaluate their associated benefits and risks HSW3 - Use appropriate methodology, including information and communication technology (ICT), to answer scientific questions and solve scientific problems HSW4 - Carry out experimental and investigative activities, including appropriate risk management, in a range of contexts HSW5 - Analyse and interpret data to provide evidence, recognising correlations and causal relationships HSW2 - Use knowledge and understanding to pose scientific questions,	– energy transfer eV for electrons and other charged particles. **4.2.3 Resistance** – Resistance and the unit ohm – Ohm's law – I–V characteristics of resistor, filament lamp, thermistor, diode and light-emitting diode (LED) – techniques and procedures used to investigate the electrical characteristics for a range of ohmic and non-ohmic components – light-dependent resistor (LDR); variation of resistance with light intensity. **4.2.4 Resistivity** – resistivity of a material; the equation – techniques and procedures used to determine the resistivity of a metal – the variation of resistivity of metals and semiconductors with temperature – negative temperature coefficient (NTC) thermistor; variation of resistance with temperature. **4.2.5 Power** – the power equations – energy transfer		– Uniform electric fields – Electric potential and energy

		define scientific problems, present scientific arguments and scientific ideas M2.2 - Change the subject of an equation, including nonlinear equations HSW10 - Consider ethical issues in the treatment of humans, other organisms and the environment HSW12 - Evaluate the ways in which society uses science to inform decision making.			
4.3 Electrical circuits	Autumn / spring	HSW9 - Consider applications and implications of science and evaluate their associated benefits and risks HSW12 - Evaluate the ways in which society uses science to inform decision making. HSW5 - Analyse and interpret data to provide evidence, recognising correlations and causal relationships	**4.3.1 Series and parallel circuits** – Kirchhoff's second law; the conservation of energy – Kirchhoff's first and second laws applied to electrical circuits – total resistance of two or more resistors in series – total resistance of two or more resistors in parallel – analysis of circuits with components, including both series and parallel – analysis of circuits with more than one source of e.m.f. **4.3.2 Internal resistance** – source of e.m.f.; internal resistance – terminal p.d.; 'lost volts'	KS3 Electric circuits Year 10 (Combined and separate) – Electric circuits – Mains electricity	Year 13 (Capacitors) – Capacitors – Energy – charging and discharging Year 13 (Electric Fields) – Point and spherical charges – Coulomb's law – Uniform electric fields – Electric potential and energy

		HSW6 - Evaluate methodology, evidence and data, and resolve conflicting evidence HSW4 - Carry out experimental and investigative activities, including appropriate risk management, in a range of contexts HSW8 - Communicate information and ideas in appropriate ways using appropriate terminology M2.3 - Substitute numerical values into algebraic equations using appropriate units for physical quantities	– the equations E = I(R + r) and E = V + Ir – techniques and procedures used to determine the internal resistance of a chemical cell or other source of e.m.f. **4.3.3 Potential dividers** – potential divider circuit with components Learners will also be expected to know about a potentiometer as a potential divider – potential divider circuits with variable components e.g. LDR and thermistor – potential divider equations – techniques and procedures used to investigate potential divider circuits which may include a sensor such as a thermistor or an LDR.		
4.5 Quantum physics	Spring	HSW11 - Evaluate the role of the scientific community in validating new knowledge and ensuring integrity HSW1 - Use theories, models and ideas to develop scientific explanations HSW2 - Use knowledge and understanding to pose scientific questions,	**4.5.1 Photons** – the particulate nature (photon model) of electromagnetic radiation – photon as a quantum of energy of electromagnetic radiation – energy of a photon – the electronvolt (eV) as a unit of energy – using LEDs and the equation to estimate the value of Planck constant – Determine the Planck constant using different coloured LEDs. **4.5.2 The photoelectric effect** – photoelectric effect, including a simple experiment to demonstrate this effect	KS3 Light and sound, Making images and Waves Year 10 (Combined and separate) – Atomic structure Year 11 (Combined and separate) – Waves	Year 13 (Astrophysics and cosmology) – Stars – Electromagnetic radiation from stars Year 13 (Nuclear and particle physics) – The nuclear atom – Nuclear fission and fusion Year 13 (Medical imaging) – Using x-rays

		define scientific problems, present scientific arguments and scientific ideas HSW3 - Use appropriate methodology, including information and communication technology (ICT), to answer scientific questions and solve scientific problems HSW7 - Know that scientific knowledge and understanding develops over time M2.3 - Substitute numerical values into algebraic equations using appropriate units for physical quantities	and demonstration of the photoelectric effect using, e.g. gold-leaf electroscope and zinc plate – a one-to-one interaction between a photon and a surface electron – Einstein's photoelectric equation – work function; threshold frequency – the idea that the maximum kinetic energy of the photoelectrons is independent of the intensity of the incident radiation – the idea that rate of emission of photoelectrons above the threshold frequency is directly proportional to the intensity of the incident radiation. **4.5.3 Wave–particle duality** – electron diffraction, including experimental evidence of this effect. – diffraction of electrons travelling through a thin slice of polycrystalline graphite by the atoms of graphite and the spacing between the atoms – the de Broglie equation.		
6.1 Capacitors	Summer		**6.1.1 Capacitors** – Capacitance and the unit farad – charging and discharging of a capacitor or capacitor plates with reference to the flow of electrons – total capacitance of two or more capacitors in series – total capacitance of two or more capacitors in parallel – analysis of circuits containing capacitors, including resistors		

			– techniques and procedures used to investigate capacitors in both series and parallel combinations using ammeters and voltmeters **6.1.2 Energy** – p.d. – charge graph for a capacitor - energy stored is area under graph – energy stored by capacitor and equations – uses of capacitors as storage of energy. **6.1.3 Charging and discharging capacitors** – charging and discharging capacitor through a resistor – techniques and procedures to investigate the charge and the discharge of a capacitor using both meters and data-loggers – time constant of a capacitor–resistor circuit – Exponential equations of the form - for capacitor–resistor circuits – graphical methods and spreadsheet modelling of the equations for a discharging capacitor – exponential decay graph; constant-ratio property of such a graph		