West Kirby Grammar School

Curriculum Map – Year 12 – Physics Teacher 2 (2026-27)

Topic name	Term	Skills developed	Link to NC subject content and beyond	Prior learning	Next link in curriculum
2.3 Nature of quantities	Autumn	M0.6 - Use calculators to handle sin x, cos x and tan x when x is expressed in degrees or radians M4.2 - Visualise and represent 2D and 3D forms including two-dimensional representations of 3D objects M4.4 - Use Pythagoras' theorem, and the angle sum of a triangle M4.5 - Use sin, cos and tan in physical problems	**2.3.1 Scalars and vectors** – scalar and vector quantities – vector addition and subtraction – vector triangle to determine the resultant of any two coplanar vectors – resolving a vector into two perpendicular components	KS3 Forces, moving by force and hidden forces Year 11 (Combined and separate) – Forces – Motion – Acceleration	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.
3.1 Motion	Autumn	M0.1- Recognise and make use of appropriate units in calculations M1.4 - Make order of magnitude calculations M3.7 - Distinguish between instantaneous rate of change and average rate of change M3.9 - Apply the concepts underlying calculus by solving equations involving rates of change using a graphical method or spreadsheet modelling 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. M3.6 - Draw and use the slope of a tangent to a curve as a measure of rate of change HSW3 Using data-loggers to analyse motion.	**3.1.1 Kinematics** – displacement, instantaneous speed, average speed, velocity and acceleration – graphical representations of displacement, speed, velocity and acceleration – Displacement–time graphs; velocity is gradient – Velocity–time graphs; acceleration is gradient; displacement is area under graph. **3.1.2 Linear motion** – the equations of motion for constant acceleration in a straight line, including motion of bodies falling in a uniform gravitational field without air resistance – techniques and procedures used to investigate the motion and collisions of objects – acceleration g of free fall – techniques and procedures used to determine the acceleration of free fall, to include using trapdoor and electromagnet arrangement and light gates and timer arrangement – reaction time and thinking distance; braking distance and stopping distance for a vehicle. **3.1.3 Projectile motion**	KS3 Forces, moving by force and hidden forces Year 11 (Combined and separate) – Forces – Motion – Acceleration	Year 13 – Circular motion – Oscillations – Gravitational fields

		M3.4 - Determine the slope and intercept of a linear graph M3.5 - Calculate rate of change from a graph showing a linear relationship M4.3 - Calculate areas of triangles, circumferences and areas of circles, surface areas and volumes of rectangular blocks, cylinders and spheres	– independence of the vertical and horizontal motion of a projectile – two-dimensional motion of a projectile with constant velocity in one direction and constant acceleration in a perpendicular direction.		
3.2 Forces in action	Autumn	M1.1 - Use an appropriate number of significant figures HSW6 - Evaluate methodology, evidence and data, and resolve conflicting evidence HSW9 - Consider applications and implications of science and evaluate their associated benefits and risks HSW1 - Use theories, models and ideas to develop scientific explanations HSW5 - Analyse and interpret data to provide evidence, recognising correlations and causal relationships HSW4 - Carry out experimental and investigative activities, including appropriate risk management, in a range of contexts M4.1 - Use angles in regular 2D and 3D structures M4.2 - Visualise and represent 2D and 3D forms including two dimensional representations of 3D objects	**3.2.1 Dynamics** – net force = mass × acceleration; F = ma – the newton as the unit of force – weight of an object; W = mg – the terms tension, normal contact force, upthrust and friction – free-body diagrams – one- and two-dimensional motion under constant force. **3.2.2 Motion with non-uniform acceleration** – drag as the frictional force experienced by an object travelling through a fluid – factors affecting drag for an object travelling through air – motion of objects falling in a uniform gravitational field in the presence of drag – terminal velocity – techniques and procedures used to determine terminal velocity in fluids. **3.2.3 Equilibrium** – moment of force – couple; torque of a couple; torque = Fd – the principle of moments	KS3 Forces, moving by force and hidden forces Year 11 (Combined and separate) – Forces – Motion – Acceleration – Pressure	Year 13 – Circular motion – Oscillations – Gravitational fields

		M4.4 - Use Pythagoras' theorem, and the angle sum of a triangle M0.1 - Recognise and make use of appropriate units in calculations M4.3 - Calculate areas of triangles, circumferences and areas of circles, surface areas and volumes of rectangular blocks, cylinders and spheres M2.1 - Understand and use the symbols: = ??? HSW7 - Know that scientific knowledge and understanding develops over time HSW11 - Evaluate the role of the scientific community in validating new knowledge and ensuring integrity	– centre of mass; centre of gravity; experimental determination of centre of gravity – equilibrium of an object under the action of forces and torques – condition for equilibrium of three coplanar forces; triangle of forces. **3.2.4 Density and pressure** – Density – Pressure for solids, liquids and gases – upthrust on an object in a fluid; Archimedes' principle.		
3.3 Work, energy and power	Autumn	HSW2 - Use knowledge and understanding to pose scientific questions, define scientific problems, present scientific arguments and scientific ideas M0.5 - Use calculators to find and use power, exponential and logarithmic functions HSW5 - Analyse and interpret data to provide evidence, recognising correlations and causal relationships HSW6 - Evaluate methodology, evidence and data, and resolve conflicting evidence M0.3 - Use ratios, fractions and percentages HSW9 - Consider applications and implications of science and	**3.3.1 Work and conservation of energy** – work done by a force; the unit joule – W = Fx cos angle for work done by a force – the principle of conservation of energy – energy in different forms; transfer and conservation – transfer of energy is equal to work done. **3.3.2 Kinetic and potential energies** – kinetic energy of an object – gravitational potential energy of an object in a uniform gravitational field; Ep = mgh – the exchange between gravitational potential energy and kinetic energy. **3.3.3 Power** – Power and the unit watt – P = Fv	KS3 Energy Year 10 (Combined and separate) – Energy	Year 13 – Thermal Physics – Circular motion – Oscillations – Gravitational fields

		evaluate their associated benefits and risks 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.	– efficiency of a mechanical system		
3.4 Materials	Autumn	M3.2 - Plot two variables from experimental or other data HSW5 - Analyse and interpret data to provide evidence, recognising correlations and causal relationships HSW6 - Evaluate methodology, evidence and data, and resolve conflicting evidence M3.1 - Translate information between graphical, numerical and algebraic forms M0.5 - Use calculators to find and use power, exponential and logarithmic functions M3.12 - Sketch relationships which are modelled by y = k/x, y = kx2, y = k/x2, y = kx, y = sin x, y = cos x, y = e±x , and y = sin2x, y = cos2x as applied to physical relationships HSW8 - Communicate information and ideas in appropriate ways using appropriate terminology HSW4 - Carry out experimental and investigative activities, including appropriate risk	**3.4.1 Springs** – tensile and compressive deformation; extension and compression – Hooke's law – force constant k of a spring or wire; F = kx – force–extension (or compression) graphs for springs and wires – techniques and procedures used to investigate force–extension characteristics for arrangements which may include springs, rubber bands, polythene strips. **3.4.2 Mechanical properties of matter** – force–extension (or compression) graph; work done is area under graph – elastic potential energy – stress, strain and ultimate tensile strength – Young modulus) – techniques and procedures used to determine the Young modulus for a metal – stress–strain graphs for typical ductile, brittle and polymeric materials – elastic and plastic deformations of materials.	KS3 Forces, moving by force and hidden forces KS3 Energy Year 10 (Combined and separate) – Energy Year 11 (Combined and separate) – Forces – Motion – Acceleration – Pressure	Year 13 – Circular motion – Oscillations – Gravitational fields

		management, in a range of contexts HSW5 - Analyse and interpret data to provide evidence, recognising correlations and causal relationships 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.			
3.5 Newton's laws of motion and momentum	Autumn/ Spring 1	HSW7 - Know that scientific knowledge and understanding develops over time HSW9 - Consider applications and implications of science and evaluate their associated benefits and risks HSW10 - Consider ethical issues in the treatment of humans, other organisms and the environment M2.1 - Understand and use the symbols: =,1 2 ,,, % & , , \ ., T M3.9 - Apply the concepts underlying calculus (but without requiring the explicit use of derivatives or integrals) by solving equations involving rates of change using a graphical method or spreadsheet modelling HSW3 - Use appropriate methodology, including information and communication technology (ICT), to answer	**3.5.1 Newton's laws of motion** – Newton's three laws of motion – linear momentum; p = mv; vector nature of momentum – net force = rate of change of momentum – impulse of a force – impulse is equal to the area under a force–time graph. **3.5.2 Collisions** – the principle of conservation of momentum – collisions and interaction of bodies in one dimension and in two dimensions – perfectly elastic collision and inelastic collision.	KS3 Forces, moving by force and hidden forces Year 11 (Combined and separate) – Forces – Motion – Acceleration – Pressure	Year 13 – Circular motion – Oscillations – Gravitational fields

		scientific questions and solve scientific problems M3.8 - Understand the possible physical significance of the area between a curve and the x axis and be able to calculate it or estimate it by graphical methods as appropriate M4.3 - Calculate areas of triangles, circumferences and areas of circles, surface areas and volumes of rectangular blocks, cylinders and spheres HSW11 - Evaluate the role of the scientific community in validating new knowledge and ensuring integrity HSW12 - Evaluate the ways in which society uses science to inform decision making. 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 HSW6 - Evaluate methodology, evidence and data, and resolve conflicting evidence			
4.4 Waves	Spring 2	HSW8 - Communicate information and ideas in appropriate ways using appropriate terminology HSW5 - Analyse and interpret data to provide evidence,	**4.4.1 Wave motion** – progressive waves; longitudinal and transverse waves – displacement, amplitude, wavelength, period, phase difference, frequency and speed of a wave	KS3 Light and sound, Making images and Waves	Year 13 – Oscillations – Cosmology

		recognising correlations and causal relationships HSW1 - Use theories, models and ideas to develop scientific explanations HSW4 - Carry out experimental and investigative activities, including appropriate risk management, in a range of contexts HSW9 - Consider applications and implications of science and evaluate their associated benefits and risks HSW7 - Know that scientific knowledge and understanding develops over time M4.6 - Use of small angle approximations where appropriate	– techniques and procedures used to use an oscilloscope to determine frequency – the frequency equation – the wave equation – graphical representations of transverse and longitudinal waves – reflection, refraction, polarisation and diffraction of all waves – techniques and procedures used to demonstrate wave effects using a ripple tank – techniques and procedures used to observe polarising effects using microwaves and light – intensity of a progressive wave **4.4.2 Electromagnetic waves** – electromagnetic spectrum; properties of electromagnetic waves – orders of magnitude of wavelengths of the principal radiations from radio waves to gamma rays – plane polarised waves; polarisation of electromagnetic waves – refraction of light and refractive index – techniques and procedures used to investigate refraction and total internal reflection of light using ray boxes, including transparent rectangular and semi-circular blocks – critical angle and total internal reflection **4.4.3 Superposition** – the principle of superposition of waves – techniques and procedures used for superposition experiments using sound, light and microwaves – graphical methods to illustrate the principle of superposition	Year 10 / 11 (Combined and separate) – Waves	

			– interference, coherence, path difference and phase difference – constructive interference and destructive interference in terms of path difference and phase difference – two-source interference with sound and microwaves – Young double-slit experiment using visible light – Lambda = ax / D for all waves where a ≪D – techniques and procedures used to determine the wavelength of light using (1) a double-slit, and (2) a diffraction grating **4.4.4 Stationary waves** – stationary (standing) waves using microwaves, stretched strings and air columns – graphical representations of a stationary wave – similarities and the differences between stationary and progressive waves – nodes and antinodes – stationary wave patterns for a stretched string and air columns in closed and open tubes – techniques and procedures used to determine the speed of sound in air by formation of stationary waves in a resonance tube – The separation between adjacent nodes (or antinodes) – fundamental mode of vibration (1st harmonic); harmonics.		
5.1	Summer	HSW7 - Know that scientific knowledge and understanding develops over time HSW1 - Use theories, models and ideas to develop scientific explanations	**5.1.1 Temperature** – thermal equilibrium – absolute scale of temperature (i.e. the thermodynamic scale) that does not depend on property of any particular substance	KS3 Heating and cooling Year 10 (Combined and separate)	

		HSW2 - Use knowledge and understanding to pose scientific questions, define scientific problems, present scientific arguments and scientific ideas 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	– temperature measurements both in degrees Celsius (°C) and in kelvin (K) – Celsius and kelvin conversions **5.1.2 Solid, liquid and gas** – solids, liquids and gases in terms of the spacing, ordering and motion of atoms or molecules – simple kinetic model for solids, liquids and gases – Brownian motion in terms of the kinetic model of matter and a simple demonstration using smoke particles suspended in air – internal energy as the sum of the random distribution of kinetic and potential energies associated with the molecules of a system – absolute zero (0 K) as the lowest limit for temperature; the temperature at which a substance has minimum internal energy – increase in the internal energy of a body as its temperature rises – changes in the internal energy of a substance during change of phase; constant temperature during change of phase. **5.1.3 Thermal properties of materials** – specific heat capacity of a substance – an electrical experiment to determine the specific heat capacity of a metal or a liquid – techniques and procedures used for an electrical method to determine the specific heat capacity of a metal block and a liquid – specific latent heat of fusion and specific latent heat of vaporisation – an electrical experiment to determine the specific latent heat of fusion and vaporisation – techniques and procedures used for an electrical method to determine the specific latent heat of a solid and a liquid.	– Atomic structure Year 10 (Combined and separate) – Particle model of matter	

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