West Kirby Grammar School

Curriculum Map – Year 13 – Physics Teacher 2 (2026-27)

Topic name	Term	Skills developed	Link to NC subject content and beyond	Prior learning	Next link in curriculum
5.1 Thermal Physics	Autumn	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 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	**5.1.4 Ideal gases** – amount of substance in moles; Avogadro constant – model of kinetic theory of gases – pressure in terms of this model – the equation of state of an ideal gas – techniques and procedures used to investigate PV = constant (Boyle's law) and P/T = constant – an estimation of absolute zero using variation of gas temperature with pressure – the equation pV = 1/3 Nmc2 – root mean square (r.m.s.) speed; mean square speed – the Boltzmann constant and linked equations – internal energy of an ideal gas.	KS3 Heating and cooling Year 10 (Combined and separate) – Atomic structure Year 10 (Combined and separate) – Particle model of matter	Further study opportunities beyond KS5
5.2 Circular Motion	Autumn	M4.7 - Understand the relationship between degrees and radians and translate from one to the other 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 HSW5 - Analyse and interpret data to provide evidence, recognising correlations and causal relationships HSW9 - Consider applications and implications of science and	**5.2.1 Kinematics of circular motion** – the radian as a measure of angle – period and frequency of an object in circular motion – angular velocity **5.2.2 Centripetal force** – a constant net force perpendicular to the velocity of an object causes it to travel in a circular path – constant speed in a circle – centripetal acceleration – centripetal force – techniques and procedures used to investigate circular motion using a whirling bung.	KS3 Forces, moving by force and hidden forces Year 11 (Combined and separate) – Forces – Motion – Acceleration Year 12 – Motion – Forces in action	

		evaluate their associated benefits and risks M2.4 - Solve algebraic equations, including quadratic equations			
5.3 Oscillations	Autumn	M4.7 - Understand the relationship between degrees and radians and translate from one to the other HSW8 - Communicate information and ideas in appropriate ways using appropriate terminology HSW5 - Analyse and interpret data to provide evidence, recognising correlations and causal relationships M3.9- Apply the concepts underlying calculus (but without requiring the explicit use of derivatives or integrals) by solving equations involving rates of change, e.g. t x x T T =-m using a graphical method or spreadsheet modelling 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 M2.2 - Change the subject of an equation, including nonlinear equations	**5.3.1 Simple harmonic oscillations** – displacement, amplitude, period, frequency, angular frequency and phase difference – angular frequency – simple harmonic motion – techniques and procedures used to determine the period/frequency of simple harmonic oscillations – the period of a simple harmonic oscillator is independent of its amplitude (isochronous oscillator) – graphical methods to relate the changes in displacement, velocity and acceleration during simple harmonic motion. **5.3.2 Energy of a simple harmonic oscillator** – interchange between kinetic and potential energy during simple harmonic motion – energy-displacement graphs for a simple harmonic oscillator **5.3.3 Damping** – free and forced oscillations – the effects of damping on an oscillatory system – observe forced and damped oscillations for a range of systems – resonance; natural frequency – amplitude-driving frequency graphs for forced oscillators	KS3 Forces, moving by force and hidden forces Year 11 (Combined and separate) – Forces – Motion – Acceleration Year 12 – Motion – Forces in action	

		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 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.	– practical examples of forced oscillations and resonance.		
5.4 Gravitational fields	Spring	HSW1 - Use theories, models and ideas to develop scientific explanations M2.3 - Substitute numerical values into algebraic equations using appropriate units for physical quantities HSW7 - Know that scientific knowledge and understanding develops over time HSW2 - Use knowledge and understanding to pose scientific questions, define scientific problems, present scientific arguments and scientific ideas HSW9 - Consider applications and implications of science and evaluate their associated benefits and risks	**5.4.1 Point and spherical masses** – gravitational fields are due to objects having mass – modelling the mass of a spherical object as a point mass at its centre – gravitational field lines to map gravitational fields – gravitational field strength – the concept of gravitational fields as being one of a number of forms of field giving rise to a force. **5.4.2 Newton's law of gravitation** – Newton's law of gravitation for the force between two point masses – gravitational field strength g – gravitational field strength is uniform close to the surface of the Earth and numerically equal to the acceleration of free fall. **5.4.3 Planetary Motion**	KS3 Forces, moving by force and hidden forces Year 11 (Combined and separate) – Forces – Motion – Acceleration Year 12 – Motion – Forces in action	

		HSW10 - Consider ethical issues in the treatment of humans, other organisms and the environment HSW5 - Analyse and interpret data to provide evidence, recognising correlations and causal relationships HSW8 - Communicate information and ideas in appropriate ways using appropriate terminology HSW11 - Evaluate the role of the scientific community in validating new knowledge and ensuring integrity	– Kepler's three laws of planetary motion – the centripetal force on a planet is provided by the gravitational force between it and the Sun – the equation ?? – the relationship for Kepler's third law applied to systems other than our solar system – geostationary orbit; uses of geostationary satellites. **5.4.4 Gravitational potential and energy** – gravitational potential at a point as the work done in bringing unit mass from infinity to the point; gravitational potential is zero at infinity – gravitational potential and changes in gravitational potential – force–distance graph for a point or spherical mass; work done is area under graph – gravitational potential energy at a distance r from a point mass M – escape velocity.		
5.5 Cosmology	Spring / Summer1	HSW7 - Know that scientific knowledge and understanding develops over time HSW8 - Communicate information and ideas in appropriate ways using appropriate terminology HSW2 - Use knowledge and understanding to pose scientific questions, define scientific problems, present scientific arguments and scientific ideas M0.4 - Estimate results HSW5 - Analyse and interpret data to provide evidence, recognising correlations and causal relationships	**5.5.1 Stars** – the terms planets, planetary satellites, comets, solar systems, galaxies and the universe – formation of a star from interstellar dust and gas in terms of gravitational collapse, fusion of hydrogen into helium, radiation and gas pressure – evolution of a low-mass star like our Sun into a red giant and white dwarf; planetary nebula – characteristics of a white dwarf; electron degeneracy pressure; Chandrasekhar limit – evolution of a massive star into a red super giant and then either a neutron star or black hole; supernova – characteristics of a neutron star and a black hole HSW8 – Hertzsprung–Russell (HR) diagram	KS3 Forces, moving by force and hidden forces Year 11 (Combined and separate) – Forces – Motion – Acceleration – Pressure KS3 Heating and cooling Year 10 (Combined and separate) – Atomic structure	

		M4.6 - Use of small angle approximations including sin i, tan i, cos 1 i. for small i where appropriate 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 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 HSW6 - Evaluate methodology, evidence and data, and resolve conflicting evidence	**5.5.2 Electromagnetic radiation from stars** – energy levels of electrons in isolated gas atoms – the idea that energy levels have negative values – emission spectral lines from hot gases in terms of emission of photons and transition of electrons between discrete energy levels – the equations E = hf and E = hc/lambda – different atoms have different spectral lines which can be used to identify elements within stars – continuous spectrum, emission line spectrum and absorption line spectrum – transmission diffraction grating used to determine the wavelength of light – the condition for maxima – use of Wien's displacement law to estimate the peak surface temperature – luminosity L of a star and Stefan's law – use of Wien's displacement law and Stefan's law to estimate the radius of a star. **5.5.3 Cosmology** – distances measured in astronomical unit, light-year and parsec – stellar parallax – the equation p = 1/d, where p is the parallax in seconds of arc and d is the distance in parsec – the Cosmological principle; universe is homogeneous, isotropic and the laws of physics are universal – Doppler effect; Doppler shift of electromagnetic radiation – Doppler equation for a source of electromagnetic radiation moving relative to an observer – Hubble's law	Year 10 (Combined and separate) – Particle model of matter	

			– model of an expanding universe supported by galactic red shift – Hubble constant – the Big Bang theory – experimental evidence for the Big Bang theory from microwave background radiation at a temperature of 2.7 K – the idea that the Big Bang gave rise to the expansion of space-time – estimation for the age of the universe – evolution of the universe after the Big Bang to the present – current ideas; universe is made up of dark energy, dark matter, and a small percentage of ordinary matter.		