West Kirby Grammar School

Curriculum Map – Year 13 – Physics (Teacher 1)

Topic name	Term	Skills developed	Link to subject content	Prior learning	Next link in curriculum
3.6 Further mechanics and thermal physics 3.6.1 Periodic motion 3.6.1.1 Circular motion	Autumn	MS 0.4 Estimate the acceleration and centripetal force in situations that involve rotation.	3.6.1.1 Circular motion 1. Motion in a circular path at constant speed implies there is an acceleration and requires a centripetal force. 2. Magnitude of angular speed 3. Radian measure of angle. 4. Centripetal acceleration 5. Centripetal force F = mv2 r = m□2 r	Links from GCSE: Year 9: Forces and motion, including vectors and scalars. Year 10 energy stores, including kinetic and potential energy. Year 11: Newton's laws Links from Year 12 AS Physics: Mechanics and Materials unit: Vectors and scalars, Newton's laws, Work and power	Turning Points (Year 13 spring term) when discussing the discovery of the electron and the deflection by a magnetic field.
3.6 Further mechanics and thermal physics 3.6.1 Periodic motion 3.6.1.2 Simple harmonic motion (SHM)	Autumn	AT i, k Data loggers can be used to produce s – t, v – t and a – t graphs for SHM. MS 3.6, 3.8, 3.9, 3.12 Sketch relationships between x, v, a and a – t for simple harmonic oscillators.	3.6.1.2 Simple Harmonic Motion 1. Analysis of characteristics of simple harmonic motion (SHM). 2. Condition for SHM: a ∝ – x Defining equation: a = – □2 x 3. x = Acos □t and v = ± □ A2 – x 2 4. Graphical representations linking the variations of x, v and a with time. Appreciation that the v – t graph is derived from the gradient of the x – t graph and that the a – t graph is derived from the gradient of the v – t graph.	Links from GCSE: Year 9: Forces and motion, including vectors and scalars. Year 10 energy stores, including kinetic and potential energy. Year 11: Newton's laws Links from Year 12 AS Physics: Mechanics and Materials unit: Vectors and scalars, Newton's laws, Work and power	

			5. Maximum speed = ?A Maximum acceleration = ?2 A		
3.6 Further mechanics and thermal physics 3.6.1 Periodic motion 3.6.1.3 Simple harmonic motion (SHM)	Autumn	MS 4.6 / AT b, c Students should recognise the use of the small-angle approximation in the derivation of the time period for examples of approximate SHM.	3.6.1.3 Simple Harmonic Motion 1. Study of mass-spring system: T = 2? m k 2. Study of simple pendulum: T = 2? l g 3. Questions may involve other harmonic oscillators (eg liquid in U-tube) 4. Variation of Ek, Ep, and total energy with both displacement and time. 5. Effects of damping on oscillations	Links to GCSE: Year 9: Forces and motion, including vectors and scalars. Year 10 energy stores, including kinetic and potential energy. Year 11: Newton's laws Links to Year 12 AS Physics: Mechanics and Materials unit: Vectors and scalars, Newton's laws, Work and power Required practical 7: Investigation into simple harmonic motion using a mass–spring system and a simple pendulum.	

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3.6 Further mechanics and thermal physics 3.6.1 Periodic motion 3.6.1.4 Forced vibrations and resonance	Autumn		3.6.1.4 Forced vibrations and resonance 1. Qualitative treatment of free and forced vibrations. 2. Resonance and the effects of damping on the sharpness of resonance. 3. Examples of these effects in mechanical systems and situations involving stationary waves.	**Links from GCSE:** Year 9: Forces and motion, including vectors and scalars. Year 10 energy stores, including kinetic and potential energy. Year 11: Newton's laws **Links from Year 12 AS Physics:** Mechanics and Materials unit: Vectors and scalars, Newton's laws, Work and power	
3.6 Further mechanics and thermal physics 3.6.2 Thermal physics 3.6.2.1 Thermal energy transfer	Spring	• MS 1.5 / PS 2.3 / AT a, b, d, f Investigate the factors that affect the change in temperature of a substance using an electrical method or the method of mixtures. Students should be able to identify random and systematic errors in the experiment and suggest ways to remove them.	3.6.2.1 Thermal energy transfer 1. Internal energy is the sum of the randomly distributed kinetic energies and potential energies of the particles in a body. 2. The internal energy of a system is increased when energy is transferred to it by heating or when work is done on it (and vice versa), eg a qualitative treatment of the first law of thermodynamics. 3. Appreciation that during a change of state the potential energies of the particle ensemble are	**Links from KS3:** Heating and cooling in year 8, including internal energy. **Links from GCSE:** Year 10 Energy stores and transfers Year 10 Thermal energy and insulation, Specific heat capacity including the RP for SHC and specific latent heat **Links from Year 12 AS Physics:** Materials unit (density)	

		PS 1.1, 4.1 / AT k Investigate, with a data logger and temperature sensor, the change in temperature with time of a substance undergoing a phase change when energy is supplied at a constant rate.	changing but not the kinetic energies. 4. Calculations involving transfer of energy. For a change of temperature: Q = mc Δ□ where c is specific heat capacity. 5. Calculations including continuous flow. For a change of state Q = ml where l is the specific latent heat.	Mechanics unit, including work done, energy and power. Electricity unit, including electrical power P=IV for electrical heating method for measuring specific heat capacity.	

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3.6 Further mechanics and thermal physics 3.6.2 Thermal physics 3.6.2.2 Ideal gases	Spring/ summer	MS 3.3, 3.4, 3.14 / AT a	3.6.2.2 Ideal gases 1. Gas laws as experimental relationships between p, V, T and the mass of the gas. 2. Concept of absolute zero of temperature. 3. Ideal gas equation: pV = nRT for n moles and pV = NkT for N molecules. 4. Work done = pΔV 5. Avogadro constant N A, molar gas constant R, Boltzmann constant k 6. Molar mass and molecular mass.	Links from KS3: Particles in chemistry year 7, pressure in year 8 forces extension unit. Links from GCSE: Ideal gas equation PV=nRT in chemistry Pressure and gases in year 9 Energy and work done in Year 10 Forces and motion in year 9 momentum in year 11 Links from Year 12 AS Physics: mechanics unit (including forces and motion, momentum, Newton's laws of motion, vectors and scalars). Required practical 8: Investigation of Boyle's law (constant temperature) and Charles's law (constant pressure) for a gas.	

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Option: 3.12 Turning Points 3.12.1 The discovery of the electron 3.12.2 Wave-particle duality 3.12.3 Special relativity	Summer		3.12.1 The discovery of the electron 1 Cathode rays 2 Thermionic emission of electrons 3 Specific charge of the electron 4 Principle of Millikan's determination of the electronic charge, e 3.12.2 Wave-particle duality 1 Newton's corpuscular theory of light 2 Significance of Young's double slits experiment 3 Electromagnetic waves 4 The discovery of photoelectricity 5 Wave–particle duality 6 Electron microscopes 3.12.3 Special relativity 1 The Michelson-Morley experiment 2 Einstein's theory of special relativity 3 Time dilation 4 Length contraction 5 Mass and energy	Links from KS4: Atomic structure Forces and motion Energy stores and transfers Electric fields Optics (refraction and lenses) Electromagnetic waves Electricity Links from AS Physics: Particles unit (electrons and specific charge, quantum physics including photoelectricity and de Broglie waves) waves and optics unit (electromagnetic waves, Interference, refraction) mechanics and materials unit (Forces and motion, Newton's laws, work, energy and power, terminal velocity) Links from A2 physics: Electric fields, magnetic fields Further Mechanics (circular motion)	