Combined Science Physics Academic Overview 2018-2019

Science						
	Term 1.1	**Term 1.2**	**Term 2.1**	**Term 2.2**	**Term 3.1**	**Term 3.1**
Year 9	Motion	Forces 1 Newton's Laws	Forces 2 Momentum and Safety	Energy	Waves	End of year assessment preparation and feedback
Year 10	EM Waves Radioactivity 1 Atoms and isotopes	Radioactivity 2 Nuclear decay and dangers	Electricity 1 Circuits and resistance	Electricity 2 Energy transfers and electrical safety	Magnetism	End of year assessment preparation and feedback
Year 11	Particle Model	Forces and matter and forces doing work	PPE 1 feedback and revision	PPE 2 preparation and feedback	Revision for GCSE examinations	

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Year 9 Combined Science Physics Curriculum Content Overview 2018-2019

Knowledge and Skills Students will be taught to….	Reading, Oracy, Literacy and Numeracy	Assessment
• Recall, use and apply a variety of equations relating to motion, forces, energy and waves • Analyse and interpret information presented in a variety of forms including graphs, tables and writen text • Carry out practical activities in order to obtain results and explain their findings using correct scientific principles • For each core pracical explain; what equipment is used, how to carry out the practical, what is being changed (independent variable), what is being measured (dependent variable), what is being controlled and why • Draw labelled diagrams of relevant practical equipment • Describe, explain and analyse information regarding the motion of objects including the use of distance-time and velocity-time graphs • Explain the effects of a variety of different forces and how these relate to Netwons laws of motion • Describe and explain how Newtons second law can be investigated • Explain how momentum is conserved during collisions and how this relates to safety features in vehicles • Explain how energy is conserved when being transferred to one form or another as both both useful and unwated forms of energy • Interpret energy transfer diagrams and evaluate the efficiency of the energy transfers • Explain the differnce between renewable and non renewable energy sources and how the use of these has changed over time • Identify the parts of waves and use these to explain the differences between different types of waves • Describe and explain how the speed of a wave can be investigated in air, liquids and solids	**Reading** • Edexcel combined science text book • Recommended reading texts • CGP revision guide • PLC checklists **Numeracy** • Recall of key values and quantities • Recall, use and application of equations • Conversion between units • Working with numbers in standard form • Drawing appropriate graphs and tables with suitable scales/ headings and plotting/ recording data • Describing mathematical patterns in experimental data and explaining them using scientific concepts • Perform calculations based on extracting data from both tables and graphs **Oracy and Literacy** • Key words • Writing a method for core practicals • Six mark questions	**Formative** • Questioning in lessons • Live student performance in lessons followed by questions • Whole class feedback during lessons • Regular peer and self assessment • Book checks for general presentation, work completion and spellings • Low stakes quizzing • Learning checkpoints in between main assessments **Summative** • 3 cumulative assessments throughout the year

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Assessment Skills, Knowledge and Concepts Map

Key learning questions	Edexcel Combined Science Physics Year 9 Assessment Phase 1 Motion
☐ What is the difference between scalar and vectors quantities? ☐ What are some typical speeds for everyday activities such as walking, running, cycling and driving a car? ☐ What are the equations related to the motion of an object? ☐ What do the different lines mean on distance-time and velocity-time graphs? ☐ How can you calculate speed, acceleration and distance from graphs of motion? ☐ Describe how light gates and other equipment can be used to measure speed and acceleration?	☐ Describe what scalar and vector quantities are and explain the differences ☐ Recall vector and scalar quantities, including: displacement/distance, velocity/speed, acceleration, force, weight/mass, momentum and energy ☐ Define what velocity is ☐ Recall and use the equations: (average) speed (metre per second, m/s) = distance (metre, m) ÷ time (s), distance travelled (metre, m) = average speed (metre per second, m/s) × time (s) ☐ Analyse distance/time graphs including determination of speed from the gradient ☐ Recall and use the equation: a=(v-u)/t, Use the equation: $v^2 - u^2 = 2\times a\times x$ ☐ Analyse velocity/time graphs to: compare acceleration from gradients qualitatively, calculate the acceleration from the gradient (for uniform acceleration only), determine distance travelled using area between the graph line and the axis (for uniform acceleration only) ☐ Describe a range of laboratory methods for determining the speeds of objects such as the use of light gates ☐ Recall some typical speeds encountered in everyday experience for wind and sound, and for walking, running, cycling and other transportation systems
Key learning questions	**Forces Part 1 Newtons Laws**
☐ What is a resultant force and how can you calculate it? ☐ Explain what happens to the motion of an object when the resultant force is zero and when it is not zero ☐ Describe the relationship between mass, weight and gravitational field strength ☐ Describe the relationship between force, mass and acceleration and the practical techniques you would use to observe this ☐ HT Only: Explain using an example why an object moving in a circular path is accelerating ☐ HT Only: Explain what is meant by inertia ☐ Describe examples of Newton's third law giving the names of the forces involved	☐ Recall Newton's first law and use it where the resultant force on a body is zero and where the resultant force is not zero ☐ Recall and use Newton's second law as: F = m x a ☐ Define weight, recall and use the equation: W = m x g ☐ Describe how weight is measured and the relationship between the weight of a body and the gravitational field strength ☐ Core Practical: Investigate the relationship between force, mass and acceleration by varying the masses added to trolleys ☐ HT ONLY: Explain that an object moving in a circular orbit at constant speed has a changing velocity ☐ HT ONLY: Explain that for motion in a circle there must be a resultant force known as a centripetal force that acts towards the centre of the circle ☐ HT ONLY: Explain that inertial mass is a measure of how difficult it is to change the velocity of an object ☐ Recall and apply Newton's third law both to equilibrium situations

Key learning questions	Edexcel Combined Science Physics Year 9 Assessment Phase 2 Forces Part 2 Momentum and Safety
☐ Explain how action-reaction forces are different to resultant forces using examples ☐ HT Only: How can you show using equations that momentum is conserved during collisions? ☐ HT Only: Describe and explain the size and direction of the forces experienced by two objects colliding using Newton's third law ☐ Explain how different factors can affect both reaction time and stopping distance of a car ☐ Describe how stopping distance changes with speed ☐ How can thinking distance and stopping distance be determined using a velocity-time graph?	☐ Recall and apply Newton's third law both to equilibrium situations ☐ HT ONLY: Recall and apply Newton's third law collision interactions and relate it to the conservation of momentum in collisions ☐ HT ONLY: Define momentum, recall and use the equation: p = m x v ☐ HT ONLY: Describe examples of momentum in collisions ☐ HT ONLY: Use Newton's second law as: F = (mv - mu)/t ☐ Explain methods of measuring human reaction times and recall typical results ☐ Recall what the stopping distance of a vehicle is the sum of and explain the effect of named factors on stopping distance ☐ Describe the factors that could affect a driver's reaction time ☐ Explain the dangers caused by large decelerations ☐ HT ONLY: Estimate the forces involved in typical situations on a public road due to decelerations ☐ Estimate how the distance required for a road vehicle to stop in an emergency varies over a range of typical speeds
Key learning questions	**Energy**
☐ Explain what factors affect GPE and KE ☐ Explain how energy can be transferred between GPE and KE in situations when an object is moving up and down ☐ What is meant by conservation of energy? ☐ Describe some typical energy transfers in everyday situations ☐ Describe common ways in which energy can be dissipated in unwanted forms and how these can be reduced ☐ Explain how different building materials can affect the rate of heat loss using the term thermal conductivity ☐ Explain the difference between renewable and non-renewable and explain how their use has changed over time	☐ Recall and use the equation to calculate the change in gravitational PE: ΔGPE = m× g ×Δh ☐ Recall and use the equation to calculate the amounts of energy associated with a moving object: KE = ½ × m × v2 ☐ Draw and interpret diagrams to represent energy transfers ☐ Explain what is meant by conservation of energy and that in a closed system there is no net change in the total energy when energy is transferred from one store into another ☐ Analyse the changes involved in energy stors and transfers for an object projected upwards or up a slope, hitting an obstacle, being accelerated by a constant force, a vehicle slowing down, bringing water to a boil in an electric kettle ☐ Explain how energy can be dissipated and stored in less useful ways such as heating the surroundings ☐ Explain ways of reducing unwanted energy transfer including through lubrication and thermal insulation ☐ Describe the effects of the thickness and thermal conductivity of the walls of a building on its rate of cooling qualitatively ☐ Recall and use the equation: efficiency = useful energy transferred / total energy supplied ☐ HT ONLY: Explain how efficiency can be increased ☐ Describe the main energy sources available for use on Earth and compare the ways in which both renewable and non-renewable sources are used and how patterns and trends in their use have changed over time

Key learning questions	Edexcel Combined Science Physics Year 9 Assessment Phase 3 Waves
☐ Explain using examples such as a cork floating in water how waves transfer energy and not matter ☐ Draw a labelled diagram to show the difference between longitudinal and transverse waves ☐ Describe how to observe reflection and refraction using practical equipment ☐ HT Only: Explain why refraction occurs in terms of wave speed ☐ HT Only: Explain what happens to the wavelength of waves during refraction ☐ Explain how to measure the speed of waves in air using a stop watch or microphone connected to an oscilloscope	☐ Recall that waves transfer energy and information without transferring matter ☐ Define and use the terms frequency, wavelength, amplitude, period, wave velocity and wavefront as applied to waves ☐ Describe the difference between longitudinal and transverse waves by referring to specific examples ☐ Recall and use both the equations for all waves: $v = f \times \lambda$ and $v = x/t$ ☐ Describe how to measure the velocity of sound in air and ripples on water surfaces ☐ Describe the effects of reflection and refraction of waves at material interfaces ☐ Explain how waves will be refracted at a boundary in terms of the change of direction ☐ HT ONLY: Explain how waves will be refracted at a boundary in terms of the change of speed ☐ Core Practical: Investigate the suitability of equipment to measure the speed, frequency and wavelength of a wave in a solid and a fluid