GCSE 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 Light	EM Waves Radioactivity 1 Atoms and isotopes	Radioactivity 2 Nuclear decay and nuclear energy	End of year assessment preparation and feedback
Year 10	Astronomy Forces doing work and their Effects	Electricity 1 Circuits and resistance Electricity 2 Energy transfers and electrical safety	Static Electricity Magnetism	Particle Model	Forces and Matter	End of year assessment preparation and feedback
Year 11	Electricity 2 Energy transfers and electrical safety Static Electricity Magnetism Astronomy Particle Model	Forces and matter and forces doing work	PPE 1 feedback and revision	PPE 2 preparation and feedback	Revision for GCSE examinations	

Year 10 GCSE Physics Curriculum Content Overview 2018-2019

Knowledge and Skills Students will be taught to….	
• Recall, use and apply a variety of equations relating to astronomy, electricity, particles and matter • 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 the organisation of our solar system, the theories of its origin and the evidence to support them • Describe the forces between objects when they are touching and at a distance to each other • Describe and explain both mathematically and using scientific principles how current, potential difference and resistance are affected by different types of circuits and components • Describe and explain what static electricity is, how it is caused and its applications • Explain how energy is transferred in circuits and transmitted safely to homes and buildings • Describe and explain the production and interaction of magnetic fields and how they can be used in motors and to produce electricity • Describe the particle arrangement of solids, liquids and gases and relate this to the density of different materials	• Explain the reasons behind the different energy transfers during an increase in temperature and a change in state of a substance and relate these to the relevant equations • Explain the relationship between temperature and pressure of gases • Explain the relationship between force and extension of a spring and the diferenent energy transfers that take place • Explain the cause of pressure in fluids, how this differs in air and water and how it also leads to upthrust

Reading, Oracy, Literacy and Numeracy	Assessment
Reading • Edexcel combined science text book • Recommended reading texts • CGP revision guide • PLC checklists	**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
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	

ERASMUS DARWIN ACADEMY

Excellence for All

Assessment Skills, Knowledge and Concepts Map

Key learning questions	Edexcel GCSE Physics Year 10 Assessment Phase 1 Astronomy
☐ What is the difference between the geocentric and heliocentric models of the solar system? ☐ What is the order of the planets in our solar system and how do they orbit the sun? ☐ What is the difference between natural and artificial satellites and how are they held in a circular path? ☐ What affects the speed of an object in orbit? ☐ What are the different stages in the life cycle of a star? ☐ What determines whether a start becomes a red giant or a white dwarf? ☐ What forms a black hole? ☐ What affects the quality of image formed by a telescope? ☐ How have telescopes improved over time? ☐ What is red shift and how is it caused? ☐ What is the difference between the steady state and big bang theories of the origin of the universe? ☐ What evidence is there to support the theories of the origin of the universe?	☐ Explain how and why both the weight of any body and the value of g differ between the surface of the Earth and the surface of other bodies in space ☐ Recall what our solar system consists of ☐ Recall the names and order, in terms of distance from the Sun, of the eight planets ☐ Describe how ideas about the structure of the Solar System have changed over time ☐ Describe the orbits of moons, planets, comets and artificial satellites ☐ Explain for circular orbits how the force of gravity can lead to changing velocity of a planet but unchanged speed ☐ Explain how, for a stable orbit, the radius must change if orbital speed changes (qualitative only) ☐ Compare the Steady State and Big Bang theories ☐ Describe evidence supporting the Big Bang theory, limited to red-shift and the cosmic microwave background (CMB) radiation ☐ Recall that as there is more evidence supporting the Big Bang theory than the Steady State theory ☐ Describe that if a wave source is moving relative to an observer there will be a change in the observed frequency and wavelength ☐ Describe the red-shift in light received from galaxies at different distances away from the Earth ☐ Explain why the red-shift of galaxies provides evidence for the Universe expanding ☐ Explain how both the Big Bang and Steady State theories of the origin of the Universe both account for red-shift of galaxies ☐ Explain how the discovery of the CMB radiation led to the Big Bang theory becoming the currently accepted model ☐ Describe the evolution of stars of similar mass to the Sun ☐ Explain how the balance between thermal expansion and gravity affects the life cycle of stars ☐ Describe the evolution of stars with a mass larger than the Sun ☐ Describe how methods of observing the Universe have changed over time including why some telescopes are located outside the Earth's atmosphere

Key learning questions	Forces Doing Work and Their Effects
☐ What is a closed system? ☐ How do you draw an energy transfer diagram? ☐ What is work done? ☐ What are the equations for gravitational potential energy and kinetic energy? ☐ What are some examples of when energy is dissipated and stored in less useful ways? ☐ How do mechanical processes become wasteful? ☐ How does lubrication reduce unwanted energy transfers? ☐ How do you calculate the efficiency of a device? ☐ What is meant by power and what is it measured in? ☐ What is meant by 'contact' and 'non-contact' forces and what are some examples? ☐ HT Only: what is a free body diagram and how would you draw one? ☐ HT Only: how do you draw a scale vector diagram and how can you use this to find a resultant force? ☐ HT Only: how can you resolve a force into its horizontal and vertical components? ☐ What is a moment and the formula to calculate it? ☐ What are some examples of situations where forces can cause rotation? ☐ What is the principle of moments? ☐ How do levers and gears work?	☐ Describe the changes involved in the way energy is stored when systems change and represent using diagrams ☐ Explain that where there are energy transfers in a closed system there is no net change to the total energy ☐ Identify the different ways that the energy of a system can be changed through work done by forces, in electrical equipment and in heating ☐ Describe how to measure the work done by a force and recall that energy transferred (joule, J) is equal to work done (joule, J) ☐ Recall and use the equation: $E = F \times d$ ☐ Describe and calculate the changes in energy involved when a system is changed by work done by forces ☐ Recall and use the equation to calculate the change in gravitational PE when an object is raised above the ground ☐ Recall and use the equation to calculate the amounts of energy associated with a moving object: $KE = ½ \times m \times v^2$ ☐ Explain, using examples, how in all system changes energy is dissipated so that it is stored in less useful ways ☐ Explain that mechanical processes become wasteful when they cause a rise in temperature ☐ Define power as the rate at which energy is transferred and use examples to explain this definition ☐ Recall and use the equation: $P = E/t$ ☐ Recall what one Watt is equal to ☐ Recall and use the efficiency equation ☐ Describe, with examples, how objects can interact with and without contact ☐ Explain the difference between vector and scalar quantities using examples ☐ HT ONLY: Use vector diagrams to illustrate resolution of forces, a net force, and equilibrium situations ☐ HT ONLY: Draw and use free body force diagrams ☐ HT ONLY: Explain examples of the forces acting on an isolated solid object or a system where several forces lead to a resultant force ☐ Explain ways of reducing unwanted energy transfer through lubrication ☐ Describe situations where forces can cause rotation ☐ Recall and use the equation: moment of a force = force × distance normal to the direction of the force ☐ Recall and use the principle of moments in situations where rotational forces are in equilibrium ☐ Explain how levers and gears transmit the rotational effects of forces

Key learning questions	Edexcel GCSE Physics Year 10 Assessment Phase 2 Electricity 1 Circuits and Resistance
☐ What is the correct circuit symbol for a cell, battery, switch, voltmeter, ammeter, resistor, variable resistor, filament lamp, diode, thermistor, LDR and LED? ☐ Draw a diagram to show the difference between a series and parallel circuit ☐ How do you connect an ammeter and voltmeter in a circuit? ☐ What is meant by current, potential difference and resistance? ☐ What flows in a circuit to provide the current? ☐ Describe how you would use a circuit to investigate the resistance of a filament lamp and fixed resistor ☐ Explain what happens to the current in the circuit when you change the potential difference for a fixed resistor, filament lamp and diode ☐ What sequence of events causes heat to be transferred when a current flows through a component? ☐ Describe and example of where the heating effect of a current is useful and where it is not useful ☐ What happens to the resistance of an LDR and thermistor when you increase the light intensity and temperature? How does this affect the current in the circuit? ☐ In what devices might and LDR or thermistor be useful? ☐ How would the total resistance of two resistors be different when connected in series and in parallel? How would this affect the current in the circuit? ☐ How does the current in a circuit and potential difference across components differ in series and parallel circuits?	☐ Draw and use electric circuit diagrams representing them with correct symbols for common components and the positive and negative terminals of the cell / battery ☐ Describe the differences between series and parallel circuits and recall how to correctly measure current and potential difference using the appropriate equipment ☐ Define potential difference and describe what a volt is ☐ Recall and use the equation: $E = Q \times V$ ☐ Explain what electrical current is and what is the source of current in metals ☐ Recall and use the equation: $Q = I \times t$ ☐ Describe that a closed circuit with a source of potential difference will cause a current in the circuit ☐ Recall and use the equation: $V = I \times R$ ☐ Core Practical: Construct electrical circuits to: investigate the relationship between, V, I and R for a resistor and a filament lamp ☐ Explain how a circuit should be constructed to investigate resistance including the use of a variable resistor and how to correctly connect an ammeter and voltmeter for the component being investigated ☐ Explain how changing the potential difference affects the current in the circuit for a filament lamp, diode and fixed resistor and explain how this relates to resistance ☐ Describe how the resistance of a light-dependent resistor (LDR) varies with light intensity ☐ Describe how the resistance of a thermistor varies with change of temperature ☐ Recall that, when there is an electric current in a resistor, there is an energy transfer which heats the resistor ☐ Explain how electrical energy is dissipated when an electrical current does work against electrical resistance ☐ Explain ways of reducing unwanted energy transfer through low resistance wires ☐ Describe the advantages and disadvantages of the heating effect of an electric current ☐ Recall that current is conserved at a junction in a circuit ☐ Explain why, if two resistors are in series, the net resistance is increased, whereas with two in parallel the net resistance is decreased ☐ Calculate the currents, potential differences and resistances in series circuits

Key learning questions	Electricity 2 Energy transfers and electrical safety
☐ Describe the energy transfer that takes place in a kettle and a battery operated fan ☐ What is an advantage and disadvantage of the heating effect in an electrical circuit? ☐ What is a power rating? ☐ How do potential difference and current relate to power? ☐ What is an alternating current and how is it produced? ☐ What is the frequency and potential difference of a UK domestic mains supply? ☐ What is the purpose of the different wires in a plug? ☐ How do fuses and circuit breakers work?	☐ Describe power as the energy transferred per second and recall that it is measured in watt ☐ Recall and use the equation: P = E/t, P = I × V and P = I 2 × R, use the equation E = I × V × t ☐ Explain how the power transfer in any circuit device is related to potential difference and current ☐ Describe examples of the relationship between power ratings and energy transfers for domestic devices ☐ Describe how, in domestic devices, energy is transferred from batteries, a.c. mains motors and heating devices ☐ Explain the difference between direct and alternating voltage ☐ Describe what direct current (d.c.) is and recall the objects that supply it ☐ Describe what alternating current (a.c.) is and recall the frequency and voltage in the UK ☐ Explain the difference in function between the live, neutral and earth wire of a three-core electrical cable and recall the potential differences between each wire ☐ Explain the function of an earth wire and of fuses or circuit breakers in ensuring safety ☐ Explain why switches and fuses should be connected in the live wire of a domestic circuit ☐ Explain the dangers of providing any connection between the live wire and earth
Key learning questions	**Static Electricity**
☐ What is static electricity and how is it caused? ☐ Why do electrically charged objects exert a force on each other? ☐ How can a charged object induce a charge in another object? ☐ How is static electricity used in electrostatic sprayers? ☐ How can static electricity lead to a spark and why is this dangerous? ☐ How can you reduce the risk of charge building up? ☐ What is an electric field and where would you find them? ☐ How do you know where an electric field is strongest and in which direction it is pointing? ☐ How is the field around a point charge different to one between two parallel plates?	☐ Explain how an insulator can be charged by friction, through the transfer of electrons ☐ Explain how insulating materials become charged due to the loss or gain of electrons ☐ Describe the interactions between like charges and unlike charges ☐ Explain common electrostatic phenomena for movement of electrons, inc: shocks from objects, lightning & attraction by induction ☐ Explain how earthing removes excess charge ☐ Explain some of the uses of electrostatic charges in everyday situations ☐ Describe some of the dangers of sparking in everyday situations ☐ Define what an electric field is ☐ Describe the shape and direction of the electric field around a point charge and between parallel plates ☐ Relate the electrical strength of the field to the concentration of lines ☐ Explain how the concept of an electric field helps to explain the phenomena of static electricity

Key learning questions	Magnetism and the Motor Effect
☐ What is a magnetic field and which direction does it point? ☐ How can you observe a magnetic field? ☐ Explain what happens when you bring two magnets close together ☐ What is the difference between a temporary and induced magnet? ☐ What shape is the field around a current carrying wire? ☐ How do you increase the strength of the field around a wire and how does this change when it is wrapped into a solenoid? ☐ What is the motor effect? ☐ What is Fleming's left hand rule and what does it show? ☐ What is electromagnetic induction and how is it caused? ☐ How do you increase the size of an induced p.d? ☐ How can you reverse the direction of an induced potential difference/ current? ☐ What is the difference between an alternator and a dynamo? ☐ How do microphones and loudspeakers convert between sound waves and electrical signals? ☐ What is a transformer and where would you find them? ☐ What is the national grid? ☐ Why are different transformers used in the national grid? ☐ How is energy lost in the national grid?	☐ Describe the interactions between like and unlike magnetic poles ☐ Explain the difference between permanent and induced/ temporary magnets and describe their uses ☐ Describe the shape, direction and strength of the magnetic field around bar magnets and for a uniform field ☐ Describe how to observe the shape and direction of a magnetic field and how the behaviour of plotting compases are related to evidence that the core of the Earth must be magnetic ☐ Describe how to show that a current can create a magnetic effect around a long straight conductor ☐ Describe the shape and direction of a magnetic field around a conductor relating to the direction of the current ☐ Recall that the strength of the field depends on the size of the current and the distance from the conductor ☐ Explain how inside a solenoid the fields from individual coils can add together or cancel ☐ HT ONLY: Explain how magnetic forces are due to interactions between magnetic fields ☐ HT ONLY: Recall that a current carrying conductor and a magnetic will experience and equal and opposite force when placed near each other ☐ HT ONLY: Recall and use Fleming's left-hand rule to represent the relative directions of the force ☐ HT ONLY: Use the equation: F = B× I ×l ☐ HT ONLY: Explain how the force on a conductor in a magnetic field is used to cause rotation in electric motors ☐ HT ONLY: Explain how to produce an electric current by the relative movement of a magnet and a conductor in the lab & on a large-scale ☐ HT ONLY: Recall the factors that affect the size and direction of an induced potential difference ☐ HT ONLY: Describe how the magnetic field produced opposes the original change ☐ HT ONLY: Explain how electromagnetic induction is used in alternators to generate alternating current (a.c) ☐ HT ONLY: Explain how electromagnetic induction is used in dynamos to generate direct current (d.c.) ☐ HT ONLY: Explain the action of the microphone in converting sound waves into variations in current ☐ HT ONLY: Explain the action of loudspeakers and headphones in converting current into sound waves ☐ HT ONLY: Explain how an alternating current in one circuit can induce a current in another circuit in a transformer ☐ HT ONLY: Recall that a transformer can change the size of an alternating voltage ☐ HT ONLY: Use the turns ratio equation for transformers to calculate either voltage or number of turns: Vp/Vs = Np/Ns ☐ Explain why, in the national grid, electrical energy is transferred at different voltages ☐ Explain where and why step-up and step-down transformers are in the national grid ☐ Use the power equation (for transformers with100% efficiency): Vp × Ip =Vs × Is ☐ HT ONLY: Explain the advantages of power transmission in high voltage cables, using the equations from the specification

Key learning questions	Edexcel GCSE Physics Year 10 Assessment Phase 3 Particle Model
☐ How does the arrangement of particles affect the density of an object? ☐ How do you measure the density of an object? ☐ What are the differences between each state of matter? ☐ What is meant by the internal energy of a system? ☐ What happens to the particles when the temperature of a substance increases and when it changes state? ☐ What is absolute zero? ☐ What is specific heat capacity and how can you determine its value for water? ☐ What is latent heat and how is it different from specific heat capacity? ☐ What causes pressure in a gas? ☐ How do you increase the pressure of a gas? ☐ How is temperature related to gas pressure?	☐ Use a simple kinetic theory model to explain the different states of matter ☐ Recall and use the equation: ρ = m/V ☐ Core Practical: Investigate the densities of solid and liquids ☐ Explain the differences in density between the different states of matter in terms of particle arrangement ☐ Name and describe the physical changes of state and the differences between chemical changes ☐ Explain how heating a system will change the energy stored within the system ☐ Explain how a change in the energy store of a system can affect temperature at the state of the material ☐ Define the terms specific heat capacity and specific latent heat and explain the differences between them ☐ Use the equation: $\Delta Q = m \times c \times \Delta\theta$ ☐ Use the equation: $Q = m \times L$ ☐ Explain ways of reducing unwanted energy transfers through thermal insulation ☐ Core Practical: Investigate the properties of water by determining its specific heat capacity ☐ Explain the pressure of a gas in terms of the motion of its particles ☐ Explain the effect of changing the temperature of a gas on the velocity of its particles and hence on the pressure ☐ Describe the term absolute zero, −273 °C, in terms of movement of particles ☐ Convert between the kelvin and Celsius scales ☐ HT ONLY: Explain why doing work on a gas can increase its temperature, including a bicycle pump
Key learning questions	**Forces and Matter**
☐ What is needed to cause either compression or extension? ☐ What is meant by elastic and inelastic distortion? ☐ When is the relationship between force and extension linear and when is it non-linear? ☐ How do you determine the work done in stretching a spring using an equation or a graph? ☐ How can you investigate force and extension for different springs? ☐ How is pressure related to depth and density in fluids? ☐ What is upthrust and how is it linked to pressure? ☐ How do upthrust and density determine whether or not an object floats or sinks?	☐ Explain, using springs and other elastic objects, that stretching, bending or compressing an object requires more than one force ☐ Describe the difference between elastic and inelastic distortion ☐ Recall and use the equation for linear elastic distortion including calculating the spring constant: F = k x x ☐ Use the equation to calculate the work done in stretching a spring: E = ½ k x x2 ☐ Describe the difference between linear and non-linear relationships between force and extension ☐ Core Practical: Investigate the extension and work done when applying forces to a spring ☐ HT ONLY: Explain why the pressure in liquids varies with density and depth ☐ HT ONLY: Use the equation to calculate the magnitude of pressure in liquids & differences at different depths ☐ HT ONLY: Explain why an object in a fluid is subject to an upwards force (upthrust) ☐ HT ONLY: Relate upthrust to examples including objects that are fully immersed in a fluid (liquid or gas) ☐ HT ONLY: Relate upthrust to examples including objects that are partially immersed in a liquid ☐ HT ONLY: Recall that the upthrust is equal to the weight of fluid displaced ☐ HT ONLY: Explain the factors influence whether an object will float or sink