(Triple Science) Physics Paper 2	Confidence Level		
	Red	Amber	Green
Topic 1 – Key concepts			
Recall and use the SI unit for physical quantities, as listed in the specification			
Recall and use multiples and sub-multiples of units, including giga (G), mega (M), kilo (k), centi (c), milli (m), micro (μ) and nano (n)			
Be able to convert between different units, including hours to seconds			
Use significant figures and standard form where appropriate			
Topic 8 – Energy – forces doing work			
Describe the changes involved in the way energy is stored when systems change			
Draw and interpret diagrams to represent energy transfers			
Explain that where there are energy transfers in a closed system there is no net change to the total energy in that system			
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: $\Delta GPE = m \times g \times \Delta h$			
Recall and use the equation to calculate the amounts of energy associated with a moving object: $KE = \frac{1}{2} \times m \times v^2$			
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 so dissipating energy in heating the surroundings			
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			
Topic 9 – Forces and their effects			
Describe, with examples, how objects can interact with and without contact			
Explain the difference between vector and scalar quantities using examples			
Explain ways of reducing unwanted energy transfer through lubrication			
Phy ONLY: Describe situations where forces can cause rotation			
Phy ONLY: Recall and use the equation: moment of a force = force × distance normal to the direction of the force			
Phy ONLY: Recall and use the principle of moments in situations where rotational forces are in equilibrium			
Phy ONLY: Explain how levers and gears transmit the rotational effects of forces			
Higher Tier Only			
Use vector diagrams to illustrate resolution of forces, a net force, and equilibrium situations			
Draw and use free body force diagrams			
Explain examples of the forces acting on an isolated solid object or a system where several forces lead to a resultant force			
Topic 10a – Electricity and circuits – part a			
Describe the structure of the atom, limited to the position, mass and charge of protons, neutrons and electrons			

Draw and use electric circuit diagrams			
Describe the differences between series and parallel circuits			
Recall how to measure potential difference using a voltmeter in series and parallel circuits			
Define potential difference end describe what a volt is			
Recall and use the equation: $\boldsymbol{E = Q \times V}$			
Recall how to measure current using an ammeter in series and parallel circuits			
Explain what electrical current is			
Recall and use the equation: $\boldsymbol{Q = I \times t}$			
Describe that when a closed circuit includes a source of potential difference there will be a current in the circuit			
Recall that current is conserved at a junction in a circuit			
Describe how to use a variable resistor in a circuit			
Recall and use the equation: $\boldsymbol{V = I \times R}$			
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			
Explain the design and construction of series circuits for testing and measuring			
Core Practical: Construct electrical circuits to: investigate the relationship between, V, I and R for a resistor and a filament lamp			
Topic 10b – Electricity and circuits – part b			
Explain how I varies with V for the following devices and how this relates to R for filament lamps, diodes and fixed resistors			
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 (neg temp thermistors only)			
Explain how the design and use of circuits can be used to explore the variation of resistance in: filament lamps, diodes, thermistors & LDRs			
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 the energy transfer when 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			
Use the equation: $\boldsymbol{E = I \times V \times t}$			
Describe power as the energy transferred per second and recall that it is measured in watt			
Recall and use the equation: $\boldsymbol{P = E/t}$			
Explain how the power transfer in any circuit device is related to the potential difference across it and the current in it			
Recall and use the equations: $\boldsymbol{P = I \times V}$ and P $\boldsymbol{= I^2 \times R}$			
Describe how, in different domestic devices, energy is transferred from batteries and 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 and the neutral mains input wires			

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			
Recall the potential differences between the live, neutral and earth mains wires			
Explain the dangers of providing any connection between the live wire and earth			
Describe, with examples, the relationship between the power ratings for domestic electrical appliances and the changes in energy when used			
Topic 11 – Static electricity			
Phy ONLY: Explain how an insulator can be charged by friction, through the transfer of electrons			
Phy ONLY: Explain how insulating materials become charged due to the loss or gain of electrons			
Phy ONLY: Describe the interactions between like charges and unlike charges			
Phy ONLY: Explain common electrostatic phenomena for movement of electrons, inc: shocks from objects, lightning & attraction by induction			
Phy ONLY: Explain how earthing removes excess charge			
Phy ONLY: Explain some of the uses of electrostatic charges in everyday situations			
Phy ONLY: Describe some of the dangers of sparking in everyday situations			
Phy ONLY: Define what an electric field is			
Phy ONLY: Describe the shape and direction of the electric field around a point charge and between parallel plates			
Phy ONLY: Relate the electrical strength of the field to the concentration of lines			
Phy ONLY: Explain how the concept of an electric field helps to explain the phenomena of static electricity			
Topic 12 – Magnetism and the motor effect			
Describe the interactions between like and unlike magnetic poles			
Describe the uses of permanent and temporary magnetic materials including cobalt, steel, iron and nickel			
Explain the difference between permanent and induced magnets			
Describe the shape and direction of the magnetic field around bar magnets and for a uniform field			
Relate the strength of the magnetic field to the concentration of lines			
Describe the use of plotting compasses to show the shape and direction of the field of a magnet and the Earth's magnetic field			
Explain how the behaviour of a magnetic compass is 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 of the magnetic field produced and relating the direction of the magnetic field 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 long straight conductor			
Explain how inside a solenoid the fields from individual coils can add together or cancel			
Higher Tier Only			
Recall what happens when a current carrying conductor is placed near a magnet experiences in terms of force			
Explain how magnetic forces are due to interactions between magnetic fields			
Recall and use Fleming's left-hand rule to represent the relative directions of the force			
Use the equation: $F = B \times I \times l$			

Explain how the force on a conductor in a magnetic field is used to cause rotation in electric motors			
Topic 13 – Electromagnetic induction			
Explain why, in the national grid, electrical energy is transferred at different voltages			
Explain where and why step-up and step-down transformers are used in the transmission of electricity in the national grid			
Use the power equation (for transformers with100% efficiency): $V_p \times I_p = V_s \times I_s$			
Higher Tier 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			
Recall the factors that affect the size and direction of an induced potential difference			
Describe how the magnetic field produced opposes the original change			
Explain how electromagnetic induction is used in alternators to generate alternating current (a.c)			
Explain how electromagnetic induction is used in dynamos to generate direct current (d.c.)			
Explain the action of the microphone in converting sound waves into variations in current			
Explain the action of loudspeakers and headphones in converting current into sound waves			
Explain how an alternating current in one circuit can induce a current in another circuit in a transformer			
Recall that a transformer can change the size of an alternating voltage			
Use the turns ratio equation for transformers to calculate either voltage or number of turns: $V_p/V_s = N_p/N_s$			
Explain the advantages of power transmission in high voltage cables, using the equations from the spec			
Topic 14 – Particle model			
Use a simple kinetic theory model to explain the different states of matter			
Recall and use the equation: $\boldsymbol{\rho = m/V}$			
Core Practical: Investigate the densities of solid and liquids			
Explain the differences in density between the different states of matter in terms of the arrangements of the particles			
Name and describe the physical changes of state			
Describe the differences between chemical and physical changes			
Explain how heating a system will change the energy stored within the system and 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: $\boldsymbol{\Delta Q = m \times c \times \Delta\theta}$			
Use the equation: $\boldsymbol{Q = m \times L}$			
Explain ways of reducing unwanted energy transfers through thermal insulation			
Core Practical: Investigate the properties of water by determining the specific heat capacity of water for melting ice			
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			
Phy ONLY: Explain that gases can be compressed or expanded by pressure changes			

Phy ONLY: Explain that the pressure of a gas produces a net force at right angles to any surface			
Phy ONLY: Explain the effect of changing the volume of a gas on the rate at which its particles collide with the walls of its container and therefore pressure			
Phy ONLY: Use the equation: $P_1 \times V_1 = P_2 \times V_2$			
Higher Tier Only			
Explain why doing work on a gas can increase its temperature, including a bicycle pump			
Topic 15 – Forces and matter			
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: $F = k \times x$			
Use the equation to calculate the work done in stretching a spring: $E = \frac{1}{2} k \times x^2$			
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			
Phy ONLY: Explain why atmospheric pressure varies with height above the Earth's surface with refer to Earth's atmosphere			
Phy ONLY: Describe the pressure in a fluid as being due to the fluid and atmospheric pressure			
Phy ONLY: Recall that the pressure in fluids causes a force normal to any surface			
Phy ONLY: Explain how pressure is related to force and area, using appropriate examples			
Phy ONLY: Recall and use the equation: $P = F/A$			
Phy ONLY: Describe how pressure in fluids increases with depth and density			
Higher Tier Only			
Explain why the pressure in liquids varies with density and depth			
Use the equation to calculate the magnitude of pressure in liquids & differences at different depths: $P = h \times \rho \times g$			
Explain why an object in a fluid is subject to an upwards force (upthrust)			
Relate upthrust to examples including objects that are fully immersed in a fluid (liquid or gas)			
Relate upthrust to examples including objects that are partially immersed in a liquid			
Recall that the upthrust is equal to the weight of fluid displaced			
Explain the factors influence whether an object will float or sink			