KS4 Combined Science Trilogy Scheme of Work - Physics

Lesson Title	**Objectives**	**Activities**	**Outcomes**
Topic 3 Particle Model of matter Density	How to determine the density of a material. Equation for density should be known. Describe and explain the different particle arrangements in solids, liquids and gases due to the bonds between the atoms.	Use appropriate apparatus to make and record the measurements needed to determine the densities of regular and irregular solid objects and liquids. Volume should be determined from the dimensions of regularly shaped objects and by a displacement technique for irregularly shaped objects.	Define density. Describe how the density of regular and irregular shapes can be found by experiment. Calculate the density, mass or volume of an object given any two other values. Explain how the particle model can be used to explain the different states of matter.
Changing State and Internal Energy	Describe the changes of state in terms of solids, liquids and gases. Describe the difference between a chemical and a physical change and provide examples for both types. Describe and explain how increasing the temperature of a substance affects the internal energy of a substance. Define internal energy. Explain how the strength of the bonds between the particles will affect how much energy is needed to change the state of the substance.	Demonstrate physical and chemical changes and, where possible, the reversibility of a physical change, eg melting ice and then refreezing. Investigate the heating curve for water by heating some ice in a beaker until the water evaporates. Or use wax and plot a cooling curve.	Explain how, when a substance changes state, the mass of the substance is unchanged as there is still the same number of atoms in the substance and it is just their arrangement that has altered. Describe how, if a physical change is reversed, the substance will recover its original properties. Evaluate data on the melting points and boiling points of different substances linked to the strength of the forces between the particles. Explain what is happening at each stage of the heating curve produced.
Specific Heat Capacity and Specific Latent Heat	Define specific heat capacity and learn how to use the equation for thermal energy to calculate specific heat capacity.	Plan a practical to investigate the rate of heating of various metals using a joulemeter to determine the energy input. If no joulemeter is available, use an ammeter, *I*, a voltmeter, *V*, and heat the	Describe the factors that affect how quickly the temperature of a substance increases, eg why does a half-full kettle heat up faster than a full kettle of water?

	Determine the specific heat capacity of water by experiment. Define specific latent heat. Specific latent heat of fusion – change of state from solid to liquid. Specific latent heat of vaporisation – change of state from liquid to vapour.	material for a fixed amount of time, *t*. Calculate the energy transferred, *E,* using: $E = I \ x \ t \ x \ V$ Evaluate the use of different coolants used in fridges in terms of the specific latent heat of the coolant and the boiling point of the coolant. Research the use of coolants in fridges.	Calculate the change in thermal energy, mass, specific heat capacity or the temperature change of a substance that is heated or cooled. Draw heating and cooling graphs for a substance including a change of state. Interpret a heating or cooling graph to explain what is happening at each stage of the graph. Explain why a block of ice at 0 °C that is being heated does not increase in temperature initially. Calculate the energy for a change of state, mass or specific latent heat of a substance given the other values.
Gas Pressure	Using the particle model of matter explain motion of particles in a gas. Know • How gases exert forces on the walls of their containers. • How changing the temperature of a gas affects the pressure exerted.	Why are gas cylinders likely to explode in a fire? Why do car tyre pressures have to be checked when cold, rather than after a long drive? Draw particle diagrams to show how gas pressure increases as volume decreases or temperature increases.	Describe and explain how the motion of molecules in a gas changes as the gas is heated. Explain what is meant by gas pressure in terms of the forces exerted by the gas molecules on a given area. Describe and explain how changing the temperature of gas increases the gas pressure inside the container.
Topic 4 Atomic Structure Atomic Structure, Isotopes and Types of Radiation	Recall the size and structure of an atom. Describe and explain how electrons can be moved further away from the nucleus of the atom and how they lose energy to move closer to the nucleus.	Research how absorption and emission spectra are formed. Fill in a table summarising the properties of the three types of radiation.	Describe and explain how electrons can be moved further away from the nucleus of the atom and how they lose energy to move closer to the nucleus.

	Explain how the wavelength of the electromagnetic wave emitted by an electron changes in relation to how far the electron has moved towards the nucleus. Define isotope. Know that • Some atomic nuclei are unstable. The nucleus gives out ionising radiation as it changes to become more stable. This is a random process called radioactive decay. • Activity is the rate at which a source of unstable nuclei decays and is measured in Becquerel. • The nature of different types of nuclear radiation.	Draw a diagram to illustrate the penetration of the different types of nuclear radiation.	Explain how the wavelength of the electromagnetic wave emitted by an electron changes in relation to how far the electron has moved towards the nucleus. Explain how isotopes of elements, all have the same number of protons but have a different number of neutrons. Describe the composition of each type of radiation and where relevant, give the particle that the type of radiation is identical to, eg an alpha particle is a helium nucleus.
Nuclear Decay Equations and Half Life	State the composition of alpha and beta particles and be able to recall that an alpha particle can be represented as: $^{4}_{2}He$ and a beta particle can be represented as: $^{0}_{-1}e$ Complete nuclear decay calculations for alpha and beta decay. Determine half-life using calculations and graphical methods.	Complete nuclear decay calculations for alpha and beta decay. The calculations may be in the form of an equation or a table of results showing the same data. Describe in words how the nucleus of an atom changes when it undergoes alpha and beta decay. Describe how the charge of a nucleus changes as it undergoes alpha and beta decay. Draw a decay curve and determine the half life from it.	Describe what happens to an atom when it undergoes alpha, beta and gamma emission. Calculate how the mass number, the proton number and the number of neutrons in an atom change when it undergoes alpha, beta and gamma emission. Calculate the half-life of a radioactive source from a decay curve of the radioactive element. Calculate the mass of a radioactive substance remaining after a given time

		Practice calculations of masses left after a number of half lives.	when given the half-life of the substance and the initial mass of the radioactive source.
Irradiation and Contamination	Describe how radioactive contamination can occur. Describe the process and uses of irradiation. Describe and explain how radioactive sources are used safely within a science lab, looking in terms of reducing the risk of contamination and reducing the exposure to the radiation itself.	How would a person become contaminated by radiation? If a person gets contaminated by radiation how are they decontaminated? Research decontamination techniques for workers exposed to radioactive sources. Find out the advantages and disadvantages of irradiating food.	Explain how the procedure followed by people dealing with radioactive sources reduces the risk of contamination and irradiation. Explain the safety requirements needed in a work place that deals with radioactive sources.
Topic 7 Magnetism and Electromagnetism Magnets and Magnetic Fields	Know that • The poles of a magnet are the places where the magnetic forces are strongest. • When two magnets are brought close together they exert a force on each other. • The differences between permanent and induced magnets. • The difference between magnets and magnetic materials. • Magnetic compasses point to the Earth's poles due to the Earth's magnetic field.	Investigate and draw the shape of the magnetic field pattern around a permanent magnet. Draw the magnetic field pattern of a bar magnet and describe how to plot the magnetic field pattern using a compass. Investigate the effect that two magnets have on each other in different orientations. Investigate the magnetic field pattern of the Earth.	Describe two experiments that can be used to identify the magnetic field pattern of a permanent magnet. Explain what is meant by a permanent magnet and give examples of materials that can become magnetised. Explain how the behaviour of a magnetic compass is related to evidence that the core of the Earth must be magnetic. Explain what is meant by the magnetic field of a magnet.
Electromagnets	Know that • A wire carrying an electric current has its own magnetic field.	Use the 'right hand thumb rule' to draw the magnetic field pattern of a wire carrying an electric current.	Describe how the magnetic effect of a current can be demonstrated. Describe the effect on the magnetic field of changing the direction of the electric current.

	• A coil of wire carrying an electric current has its own magnetic field.	Make an electromagnet with a circuit and a coil of wire. Test the strength using paperclips. Draw the magnetic field pattern for a straight wire carrying a current and for a solenoid.	Describe ways of increasing the magnetic field strength of a solenoid. Explain how an electromagnet can be made from a solenoid.
The Motor Effect	Explain how motors rotate due to the interaction of magnetic fields and how the direction of rotation of a motor can be changed. Use Fleming's left-hand rule to find out the direction of rotation of a motor. Use the magnetic flux density equation to calculate the force in a magnetic field.	Watch a video and animations on BBC bitesize showing an electric motor and factors that affect it's movement. Practice calculations using the magnetic flux density equation in the correct units.	Explain why a motor spins with respect to the magnetic field produced by a wire carrying an electric current and the magnetic field of the permanent magnets in the motor interacting. Explain how to change the direction of the motor. Use and apply the equation : $F = B\,I\,L$ to calculate any missing value when given other values.
Topic 5 Forces Distance, Speed and Distance time graphs	Explain the difference between distance and displacement. The definition of speed, how it is calculated and some typical values. Draw and interpret distance – time graphs.	How fast do people walk and run? Pupils are timed walking a known distance and then their speed is calculated. This can then be extended to them running the same distance so their times can be compared. State typical walking, running and cycling speeds in m/s. Compare the speeds of two or more objects, or from one object at different points, on a distance – time graph from the gradients of the lines.	Define distance and displacement and explain what the difference is. Define speed and calculate it by using speed = distance/time Calculate the speed of an object given the distance travelled and the time taken. Rearrange the equation to find either unknown quantity. Use a distance time graph to find speed and interpret the pattern shown by the graphs

		State that the steeper the line on a distance – time graph, the faster the object is travelling.	
Velocity, Acceleration and Velocity Time Graphs	Define velocity and explain why velocity is a vector quantity rather than a scalar quantity. Definition and calculation of acceleration. Draw and interpret velocity – time graphs. Explain how the acceleration of an object can be found from a velocity – time graph. Be able to use the equation for uniform acceleration $v^2 - u^2 = 2\,a\,s$	Practice using the equation for acceleration and give the correct unit. Draw velocity time graphs and describe the motion during the journey. Use the graph to find speed and distance travelled. What does uniform acceleration mean? In what situations would I use $v^2 - u^2 = 2\,a\,s$ rather than speed = distance/time?	Be able to calculate the acceleration of a vehicle when given the initial and final speed and the time taken for the change in speed to occur. Rearrange the equation to find other unknown quantities. Compare the acceleration of a vehicle at different points of a velocity – time graph from the gradients of the lines. Calculate the distance travelled using the area under the line on a velocity – time graph. Use the equation $v^2 - u^2 = 2\,a\,s$ to calculate the final velocity of an object at constant acceleration.
Contact and Non-contact Forces	Describe the effects of forces in terms of changing the shape and/or motion of objects. Describe examples of contact forces explaining how the force is produced. Describe examples of non-contact forces and state how the force is produced, eg gravitational force caused by two objects with mass exerting an attractive force on each other.	Investigate contact and non-contact forces. This can include magnets, friction along a surface eg when a shoe is pulled along a surface. You can change the surface to explore how the change affects the amount of force required to move the shoe. You could also add a lubricant eg water/oil to the surface. Make parachutes of different sizes eg 10x10cm and one 50x50cm, then drop it from a height if available. Time how long it	Give examples of contact and non-contact forces and explain how the forces are produced. Examples of contact forces include friction, air resistance, tension and normal contact force. Examples of non-contact forces are gravitational force, electrostatic force and magnetic force.

		takes to fall and then discuss the change in forces. Measuring the size of a force using a Newtonmeter	
Weight and Resultant Forces	Describe and explain what weight is and why objects on Earth have weight. State the units used to measure weight Calculate the weight of an object on Earth using $W = mg$. Rearrange this equation to find any unknown quantity. Know that a number of forces acting on an object may be replaced by a single force that has the same effect as all the original forces acting together. This single force is called the resultant force.	Find the weight of objects within the laboratory using Newtonmeters and then their mass using laboratory balances or for heavier objects bathroom scales. Practice using the weight equation and compare the weight of objects on different planets. Draw force diagrams to represent forces acting parallel to each other, both in the same direction or in opposite directions. Calculate the resultant of a number of forces acting parallel to each other.	Define weight and mass and explain the difference between them. Compare the weight of an object on different planets when given the gravitational field strength of the planets. Describe the relationship between weight and mass and what would happen to weight if mass was doubled. Use diagrams to describe qualitatively examples where several forces lead to a resultant force on an object.
Work and Energy Transfer	Calculating the work done when a force moves an object. Equation for work done by a force should be known. Describe the energy transfer involved when work is done. Work done against the frictional forces acting on an object causes a rise in the temperature of the object.	Determine the work done against gravity by walking up a flight of stairs (or two). The work done in lifting various objects from the ground to bench level can be a variation of this theme. Practice using the equation.	Define work done and state the units of work. Calculate the work done by a force on an object when given the magnitude of the force and the displacement of the object. Rearrange this equation to find any unknown value. Describe the energy transfer involved when work is done on an object, eg the work done in lifting an object causes an increase in the gravitational potential energy store of that object.

Forces and Elasticity	Know that elastic deformation occurs when an object returns to its original shape and size after the forces are removed. An object that does not return to its original shape after the forces have been removed has been inelastically deformed. Understand Hooke's Law and use the equation relating the force applied to a spring and its extension.	Investigate the effect of loading and unloading springs stretched too and beyond their limit of proportionality. Add a force of 1N (100 g mass) at a time and measure the extension of the spring. Continue until the spring is clearly stretched beyond its limit of proportionality and then remove 1N at a time, recording the extension each time. Draw graphs of the results.	Define elastic deformation. Sketch and describe the force and extension curve of an elastic material (eg elastic band or spring) when not stretched beyond its limit of proportionality. Sketch and describe the force and extension curve of an elastic material when stretched beyond its limit of proportionality. Calculate the force acting on a spring when given the spring constant and the extension of the spring. Rearrange the equation to find any missing quantity.
Terminal velocity and Newton's 1st Law	Know that • Near the Earth's surface any object falling freely under gravity has an acceleration of about 9.8 m/s^2. • An object falling through a fluid initially accelerates due to the force of gravity. Eventually the resultant force will be zero and the object will move at its terminal velocity. Students should investigate factor/factors that affect the terminal velocity of a falling object. Know the definition of Newton's First Law and the consequences of it.	Hoes does the speed a parachute falls, depend on the size of the parachute? How does the weight attached to a parachute affect how quickly it falls? Label diagrams showing the forces and motion of a falling object during it's journey. Draw and interpret a terminal velocity graph. Video on Newton's first law. Draw examples using force diagrams.	Describe how the forces acting on skydiver change throughout a sky dive – from jumping out of the plane to landing on the ground. Explain how the speed of a skydiver changes throughout the dive. Define terminal velocity and describe and explain factors that affect the terminal velocity of a skydiver. State Newton's First Law. Describe the effect of having a zero resultant force on: • a stationary object • an object moving at a constant velocity. Explain that for an object travelling at terminal velocity the driving force(s)

			must equal the resistive force(s) acting on the object.
Newton's 2^{nd} and 3^{rd} Laws	Newton's Second Law: The acceleration of an object is proportional to the resultant force acting on the object, and inversely proportional to the mass of the object. Newton's Third Law: Whenever two objects interact, the forces they exert on each other are equal and opposite.	Investigate the effect of varying the force on the acceleration of an object of constant mass, and the effect of varying the mass of an object on the acceleration produced by a constant force.	Define Newton's Second Law. Calculate the resultant force acting on an object using the equation $F = m\,a$. Rearrange the equation to find any other unknown quantity. Define Newton's Third Law. Draw force diagrams to show Newton's third law, eg a falling object being pulled down by gravity and the Earth being pulled by the falling object.
Stopping Distances and Reaction Times	Learn the definitions of thinking distance, braking distance and stopping distance. Know how reaction times and thinking distance are linked. Know that when a force is applied to the brakes of a vehicle, work done by the friction force between the brakes and the wheel reduces the kinetic energy of the vehicle and the temperature of the brakes increases.	Investigate how the reaction time of a person can be affected by various factors including: • drugs (use caffeinated drinks) • distractions and • tiredness Find patterns between the speed of a vehicle and the braking distance.	Define: • thinking distance • braking distance • stopping distance. State that the overall stopping distance of a vehicle is made up of the thinking distance plus the braking distance. Describe and explain how the speed of a vehicle affects the stopping distance, for a given braking force. Describe factors that will affect the thinking and braking distance of a vehicle.
Topic 6 Waves Transverse and Longitudinal Waves	Learn that waves may be either transverse or longitudinal and describe the features of each type of wave.	Demonstrate how waves travel using a slinky spring. Draw diagrams of waves labelling the wavelength, amplitude, peak, trough and period.	Give examples of both transverse and longitudinal waves. Describe the propagation of both transverse and longitudinal waves.

	Know that waves are described by their amplitude, wavelength, frequency and period. Equation linking the wave speed, frequency and wavelength should be known.	Practice using the wave equation.	Define: • wavelength • amplitude • frequency • peak • trough • period. Calculate the wavelength of a wave from a labelled diagram of a wave. Calculate the frequency of a wave given the number of waves and the time. Calculate the speed of a wave. Rearrange the equation to find any unknown given the other two values.
Wave Behaviour	Be able to describe how to measure the speed of sound in air. Be able to measure the speed of ripples in water,	Look at different methods to measure the speed of sound in air. Find the speed of ripples on a water surface using a ripple tank. (use a simulation or video)	Describe how to measure the speed of sound in air and the speed of water ripples using a ripple tank. Interpret diagrams and data from these experiments.
Reflection and Refraction	Know that • Waves can be relected, absorbed or transmitted at a boundary. • Waves are transmitted and refracted differently by different materials.	Carry out a practical to show reflection and refraction using a ray box and glass blocks.	Construct ray diagrams to illustrate the refraction of a wave at the boundary between two different media. Explain refraction in terms of the change of speed that happens when a wave travels from one medium to a different medium.
Electromagnetic Waves	Know that electromagnetic waves are transverse waves that transfer energy	Fill in a table that lists how the EM waves are generated and the used and dangers of each.	Describe the properties common to all electromagnetic waves.

	from the source of the waves to an absorber. Be able to name the waves in the EM spectrum and describe their properties. Learn about the uses and dangers of EM waves and how they are generated.		State that electromagnetic waves transfer energy from one place to an absorber of that energy. Name the seven types of electromagnetic wave, in the correct order from longest to shortest wavelength. Describe how electromagnetic waves are generated.
Infrared Radiation	Understand that all objects are absorbing and emitting infrared radiation. Know that the hotter an object is the more Infrared radiation it emits.	Investigate how the amount of infrared radiation absorbed or radiated by a surface depends on the nature of that surface. Use a Leslie cube if available.	Explain why different surfaces absorb and emit infrared radiation at different rates.
Topic 1 Energy Energy Stores and energy systems	Know the types of energy stores and the ways in which energy can be transferred The changes involved in the way energy is stored when a system changes.	Presenting and writing descriptions and explanations: Ask students to explore questions such as: • Why do the wheels of a bike get very hot when braking hard? • Which type of car is more efficient – petrol or electric? • How is the gravitational potential energy store of an object increased? • Why does a flow of electrons along a wire allow bulbs to light and motors to spin? Describe the changes involved in the way energy is stored in simple systems. Examples could include: • vehicle braking systems (such as bike brakes)	Describe, for common situations, the changes involved in the way energy is stored when a system changes. For example: • an object projected upwards • a moving object hitting an obstacle • an object accelerated by a constant force • a vehicle slowing down • an electric kettle boiling water.

		• a ball being thrown upwards	
Calculating energy	The amount of energy associated with a moving object, or stored by an object can be calculated. Calculations to include kinetic energy, elastic potential energy and gravitational potential energy.	Calculate the kinetic energy of a moving body. Calculate the amount of energy stored by various objects including stretched springs and objects raised above the ground. Calculation of an object's speed given the kinetic energy of the object. Calculate the speed of an object, just before impact, when dropped from a given height by equating the increase in the kinetic energy store to the decrease in the gravitational potential energy store.	Calculate the kinetic energy of a moving object, stored by a stretched spring and an object raised above ground level. Use the correct units for the calculations.
Conservation of energy and power	Know that • The total amount of energy in a system remains constant though the way the energy is stored in the system can change. • The energy transfers in a system are not always useful. Energy that is transferred in a way that is not considered useful is often described as being wasted. Know that the power rating of an appliance states the rate that energy is being transferred or the rate at which work is done.	Ask students to explore questions such as: • Can energy be created or destroyed? • What is meant when people say 'energy is lost'? • How can we reduce the amount of energy being wasted by a machine? • What is the best way to reduce heat loss in the home? Investigate how the thickness of the insulating material used affects heat loss. Practice using the equations for power. Evaluate the benefits and drawbacks of using lower power devices such as compact fluorescent lamps (CFLs).	Describe, in terms of energy stores/work done, what happens when an appliance (such as a radio) is working. Evaluate the use of various types of insulation in the home. Look in particular at the effectiveness of loft insulation and cavity wall insulation. Carry out calculations to determine power, using energy transferred divided by time and work done divided by time.

	Equations for power as the rate of transfer of energy or work done should be known.		
Efficiency	Learn how to calculate efficiency and how to increase efficiency. Equations for the efficiency of an energy transfer should be known.	Practice using the efficiency equation. Ask students to explore questions such as: • Which type of power station is the most efficient? • Which type of light bulb would cost the least amount of money to use?	State the equations used to find efficiency. Calculate the efficiency of a machine as either a decimal or a percentage. Rearrange the equation to determine the total power input the machine or the useful power output. Students may have to analyse data to determine the useful energy output if they are told the energy input and the amount of wasted energy.
Energy Resources	Describe the main energy resources available for use on Earth. Distinguish between energy resources that are renewable and energy resources that are non-renewable.	Research the different types of energy resources that are available to generate electricity. For a given location determine the best way of generating electricity.	Define renewable energy resource and give examples of them. Define non-renewable energy resource and give examples of them. Explain how and why each type of energy resource is used to generate electricity even though it does have environmental impacts.
Trends in Energy use	Compare the ways that different energy resources are used.	Identify the political, social, ethical and economic considerations that may arise from the use of different energy resources.	Describe the way in which different energy resources are used and identify patterns and trends in the use of energy resources. Understand why some energy resources are more reliable than others.
Topic 2 Electricity	Know the standard symbols used in a circuit diagram.	Set up simple circuits from circuit diagrams. Circuits need to include voltmeters and ammeters so that students	Recall circuit symbols.

Electric current and circuit symbols	Know that electric currents are the flow of charge. Equation for electric current as the rate of flow of charge should be known.	are aware of how these devices are connected. Calculate the charge flow, current or time when given the other two values. State the units used for each quantity.	Identify circuit symbols used in a circuit. Construct circuit diagrams using standard symbols. Define an electric current. Describe and explain why an electric current will flow in a circuit.
Resistance and Ohm's Law	Know • How the resistance of a component affects the current through it. • How potential difference, current and resistance are linked. Equation linking potential difference, current and resistance should be known.	Investigate how increasing the resistance of a circuit affects the current. Use circuit diagrams to set up and check appropriate circuits to investigate the factors affecting the resistance of electrical circuits. This should include: • the length of a wire at constant temperature • combinations of resistors in series and parallel Analyse the results of the investigation to describe and explain how the resistance is affected.	Define resistance. Describe and explain how increasing the resistance in a circuit will affect the current through the circuit. Use the equation $V = I R$ to calculate the potential difference (voltage), current or resistance when given the other two values. State the correct SI units for each quantity (potential difference, current and resistance).
Series and Parallel Circuits	Know that series and parallel circuits are two ways of connecting electrical components. Know how current, potential difference and resistance interact in series and parallel circuits. Know the difference between the two types of circuits.	Investigate series circuits to find out how adding resistance, in the form of a variable resistor, changes the current and the potential difference. Investigate how the current in each loop of a parallel circuit compares to the current in the main branch of the circuit. Investigate the effect of adding two resistors in series in a simple circuit, then	Explain why the current through each component in a series circuit is the same. Describe how the potential difference of the power supply is shared between the components and that the share of the potential difference a component receives depends on the resistance of that component.

		adding the same resistors in parallel in the same circuit.	Describe how the currents in different parts of a parallel circuit change and give the reasons for this change. Describe the effect on the resistance of adding resistors in parallel. Describe the differences between series and parallel circuits in terms of current and potential difference.
Investigating Resistance	Identify Current-potential difference graphs for electrical components such as a resistor, lamp and diode. How the resistance of electrical components such as LDR's and Thermistors change with external conditions.	Use circuit diagrams to construct appropriate circuits to investigate the I–V characteristics of a variety of circuit elements including a filament lamp, a diode and a resistor at constant temperature. Plot the graphs for these components and explain the resulting shape in terms or resistance.	Draw the I-V graphs for a filament lamp, ohmic conductor and a diode. Explain the shape of the resulting graph in terms of resistance and current. Draw graphs to show how the resistance of an LDR will vary with light intensity and of a thermistor with temperature. Describe and explain real world applications of thermistors and LDRs including thermostats and switching on lights.
Electricity in the home	Know the difference between alternating and direct potential differences. Know that the mains electricity is an a.c. supply. In the UK it has a frequency of 50 Hz and is about 230 V. State the name, colour and function of each wire in a three core electrical cable	Match the name, colour and function of each wire. State some common sources of a direct potential difference including cells, batteries and solar cells.	Describe the potential difference of an alternating supply as changing direction. Describe mains electricity in the home in terms of potential difference, frequency and type of current. Describe the construction of a three core electric cable. State the name, the colour of the wire and the function of each wire in a three-core cable.

			Describe how the earth wire acts as a safety wire and only carries a current if there is a fault. State that the resistance of the earth wire is low and that it will allow a large current to flow through it.
Power	Electrical power and how it is calculated. Equations for electrical power should be known. Understand how to calculate the amount of energy transferred in appliances. Equations for energy transfer should be known.	Calculate the power of an electrical appliance given the potential difference and the current. Calculate the energy transferred by an electrical appliance and rearrange the equation $E = P\,t$	State and use the equation that links power, potential difference and current. Describe, with examples, the relationship between the power ratings for domestic electrical appliances and the changes in stored energy when they are in use. Calculate the energy transferred by an electrical appliance and rearrange the equation $E = P\,t$ to find the other two values.
National Grid	Know that the National Grid is a system of cables and transformers linking power stations to consumers. Know that step-up transformers are used to increase the potential difference from the power station to the transmission cables then step-down transformers are used to decrease, to a much lower value, the potential difference for domestic use.	Students will need to be able to give the types of transformer used and describe how the potential difference in the wires changes at each stage of the process.	Describe how electrical power is transferred from the power stations to the consumers via the National Grid. Explain why is it more economical to transfer power through the National Grid at high potential differences rather than using lower and potentially safer potential differences?