SP10: **Electricity and Circuits** (Paper 2)
SP11: **Static Electricity** (Paper 2)

Lesson	Objectives Tracker Sheet	Date covered	I know this well	I need to do more work on this
SP10a Electric circuits	P10.1 Describe the structure of the atom, limited to the position, mass and charge of protons, neutrons and electrons.			
	P10.2 Draw and use electric circuit diagrams representing them with the conventions of positive and negative terminals, and the symbols that represent cells, including batteries, switches, voltmeters, ammeters, resistors, variable resistors, lamps, motors, diodes, thermistors, LDRs and LEDs.			
	P10.3 Describe the differences between series and parallel circuits.			
SP10b Current and potential difference	P10.4 Recall that a voltmeter is connected in parallel with a component to measure the potential difference (voltage), in volts, across it.			
	P10.7 Recall that an ammeter is connected in series with a component to measure the current, in amps, in the component.			
	P10.10 Describe that when a closed circuit includes a source of potential difference there will be a current in the circuit.			
	P10.11 Recall that current is conserved at a junction in a circuit.			
SP10c Current, charge and energy	P10.5 Explain that potential difference (voltage) is the energy transferred per unit charge passed and hence that the volt is a joule per coulomb.			
	P10.6 Recall and use the equation: Energy transferred (joule, J) = charge moved (coulomb, C) × potential difference (volt, V) $E = Q \times V$			
	P10.8 Explain that an electric current is the rate of flow of charge and the current in metals is a flow of electrons.			
	P10.9 Recall and use the equation: charge (coulomb, C) = current (ampere, A) × time (second, s) $Q = I \times t$			
SP10d Resistance	Draw and use electric circuit diagrams […] and the symbols that represent […] resistors, variable resistors […].			
	P10.12 Explain how changing the resistance in a circuit changes the current and how this can be achieved using a variable resistor.			
	P10.13 Recall and use the equation: potential difference (volt, V) = current (ampere, A) × resistance (ohm, Ω) $V = I \times R$			
	P10.14 Explain why, if two resistors are in series, the net resistance is increased, whereas with two in parallel the net resistance is decreased.			
	P10.15 Calculate the currents, potential differences and resistances in series circuits.			
	P10.16 Explain the design and construction of series circuits for testing and measuring.			
SP10e More about resistance	P10.2 Draw and use electric circuit diagrams […] and the symbols that represent cells, including batteries, switches, voltmeters, ammeters, resistors, variable resistors, lamps, motors, diodes, thermistors, LDRs and LEDs.			

	P10.18 Explain how current varies with potential difference for the following devices and how this relates to resistance: a filament lamps b diodes c fixed resistors.			
	P10.19 Describe how the resistance of a light-dependent resistor (LDR) varies with light intensity.			
	P10.20 Describe how the resistance of a thermistor varies with change of temperature (negative temperature coefficient thermistors only).			
	P10.21 Explain how the design and use of circuits can be used to explore the variation of resistance in the following devices: a filament lamps b diodes c thermistors d LDRs.			
SP10e Investigating resistance – Core practical	P10.17 Construct electrical circuits to: a investigate the relationship between potential difference, current and resistance for a resistor and a filament lamp b test series and parallel circuits using resistors and filament lamps.			
SP10f Transferring energy	P10.22 Recall that, when there is an electric current in a resistor, there is an energy transfer which heats the resistor.			
	P10.23 Explain that electrical energy is dissipated as thermal energy in the surroundings when an electrical current does work against electrical resistance			
	P10.24 Explain the energy transfer (in 10.22 above) as the result of collisions between electrons and the ions in the lattice.			
	P10.25 H Explain ways of reducing unwanted energy transfer through low resistance wires.			
	P10.26 Describe the advantages and disadvantages of the heating effect of an electric current.			
	P10.27 Use the equation: energy transferred (joule, J) = current (ampere, A) × potential difference (volt, V) × time (second, s) $E = I \times V \times t$			
SP10g Power	P10.28 Describe power as the energy transferred per second and recall that it is measured in watts.			
	P10.29 Recall and use the equation: power (watt, W) = energy transferred (joule, J)/time taken (second, s) $P = E/t$			
	P10.30 Explain how the power transfer in any circuit device is related to the potential difference across it and the current in it.			
	P10.31 Recall and use the equations: electrical power (watt, W) = current (ampere, A) × potential difference (volt, V) $P = I \times V$ electrical power (watt, W) = current squared (ampere2, A2) × resistance (ohms, Ω) $P = I2 \times R$			
SP10h Transferring energy	P10.32 Describe how, in different domestic devices, energy is transferred from batteries and the a.c. mains to the energy of motors and heating devices.			
	P10.33 Explain the difference between direct and alternating voltage.			
	P10.34 Describe direct current (d.c.) as movement of charge in one direction only and recall that cells and batteries supply direct current (d.c.).			

	P10.35 Describe that in alternating current (a.c.) the movement of charge changes direction.			
	P10.36 Recall that in the UK the domestic supply is a.c., at a frequency of 50 Hz and a voltage of about 230 V.			
	P10.42 Describe, with examples, the relationship between the power ratings for domestic electrical appliances and the changes in stored energy when they are in use.			
SP10i Electrical safety	P10.37 Explain the difference in function between the live and the neutral mains input wires.			
	P10.38 Explain the function of an earth wire and of fuses or circuit breakers in ensuring safety.			
	P10.39 Explain why switches and fuses should be connected in the live wire of a domestic circuit.			
	P10.40 Recall the potential differences between the live, neutral and earth mains wires.			
	P10.41 Explain the dangers of providing any connection between the live wire and earth.			
SP11a Charges and static electricity	P11.1P Explain how an insulator can be charged by friction, through the transfer of electrons.			
	P11.2P Explain how the material gaining electrons becomes negatively charged and the material losing electrons is left with an equal positive charge.			
	P11.3P Recall that like charges repel and unlike charges attract.			
	P11.4P Explain common electrostatic phenomena in terms of movement of electrons, including a shocks from everyday objects b lightning c attraction by induction such as a charged balloon attracted to a wall and a charged comb picking up small pieces of paper.			
SP11b Dangers and uses of static electricity	P11.4P Explain common electrostatic phenomena in terms of movement of electrons, including a shocks from everyday objects b lightning c attraction by induction such as a charged balloon attracted to a wall and a charged comb picking up small pieces of paper.			
	P11.5P Explain how earthing removes excess charge by movement of electrons.			
	P11.6P Explain some of the uses of electrostatic charges in everyday situations, including insecticide sprayers.			
	P11.7P Describe some of the dangers of sparking in everyday situations, including fuelling cars, and explain the use of earthing to prevent dangerous build-up of charge.			
SP11c Electric fields	P11.8P Define an electric field as the region where an electric charge experiences a force.			
	P11.9P Describe the shape and direction of the electric field around a point charge and between parallel plates and relate the strength of the field to the concentration of lines.			
	P11.10P Explain how the concept of an electric field helps to explain the phenomena of static electricity.			