SP10 Electricity and Circuits

SP10a Electric circuits

Step	Learning outcome	Had a look	Nearly there	Nailed it!
7th	Describe the basic structure of an atom (positions, relative masses and relative charges of protons, neutrons and electrons).	☐	☐	☐
3rd	Recognise the circuit symbols for a range of common electrical components (cells, including batteries, switches, voltmeters, ammeters and lamps).	☐	☐	☐
4th	Draw diagrams for circuits containing common electrical components, using conventions for positive and negative terminals.	☐	☐	☐
5th	Describe and explain the difference between the brightness of identical lamps in series and parallel circuits.	☐	☐	☐
5th	Describe and explain the effects of different numbers of identical lamps, cells and switches in series and parallel circuits.	☐	☐	☐

SP10b Current and potential difference

Step	Learning outcome	Had a look	Nearly there	Nailed it!
4th	Describe how to measure voltage.	☐	☐	☐
5th	Define the term 'potential difference'.	☐	☐	☐
4th	Describe how to measure current.	☐	☐	☐
4th	Describe the conditions needed to produce an electric current. (A complete circuit and a source of voltage/potential difference.)	☐	☐	☐
4th	Describe the behaviour of current at a junction.	☐	☐	☐

SP10c Current, charge and energy

Step	Learning outcome	Had a look	Nearly there	Nailed it!
6th	Explain the link between the potential difference (voltage) across a battery or a component, the charge passing through it and the amount of energy transferred.	☐	☐	☐
6th	Recall that the unit of potential difference is the volt and explain it in terms of units of energy and charge (a potential difference of one joule per coulomb).	☐	☐	☐
8th	Recall and use the equation to calculate the energy transferred, the charge that flows or the potential difference. ($E = Q \times V$)	☐	☐	☐
5th	Explain the link between electric current and electric charge.	☐	☐	☐
5th	Explain electric current in metals in terms of electrons.	☐	☐	☐
7th	Recall and use the equation to calculate the charge that flows, the current or the time the current flows. ($Q = I \times t$)	☐	☐	☐

SP10d Resistance

Step	Learning outcome	Had a look	Nearly there	Nailed it!
6th	Explain the link between resistance and current in a circuit.	☐	☐	☐
5th	Define the resistance of a component or circuit ($R = V/I$).	☐	☐	☐
8th	Recall and use the equation to calculate the potential difference, the current or the resistance ($V = I \times R$).	☐	☐	☐
6th	Explain the difference in resistance when two resistors are connected in series or in parallel.	☐	☐	☐
7th	Calculate the currents, potential differences and resistances in series circuits.	☐	☐	☐
5th	Explain the design and construction of series circuits for testing and measuring.	☐	☐	☐

SP10e More about resistance

Step	Learning outcome	Had a look	Nearly there	Nailed it!
6th	Explain how current changes with potential difference in fixed resistors.	☐	☐	☐
6th	Explain how current and resistance change with potential difference in filament lamps.	☐	☐	☐
6th	Explain how current and resistance change with potential difference in diodes, including light-emitting diodes (LEDs).	☐	☐	☐
6th	Describe how the resistance of a light-dependent resistor (LDR) varies with changing light intensity.	☐	☐	☐
6th	Describe how the resistance of a thermistor varies with changing temperature. (negative temperature coefficient only)	☐	☐	☐
5th	Describe the uses of diodes, LDRs and thermistors.	☐	☐	☐

SP10f Transferring energy

Step	Learning outcome	Had a look	Nearly there	Nailed it!
5th	Describe the energy transfer that occurs when a current passes through a resistor.	☐	☐	☐
7th	Use the electron and ion model and the idea of electrical work to explain the energy transfer in a resistor and the resulting dissipation of energy in the surroundings.	☐	☐	☐
5th	**H** Explain how unwanted energy transfers in wires can be avoided.	☐	☐	☐
5th	Recall the advantages of the heating effect of an electric current.	☐	☐	☐
5th	Recall the disadvantages of the heating effect of an electric current.	☐	☐	☐
8th	Use the equation $E = I \times V \times t$ to calculate the energy transferred, the current, the potential difference or the time.	☐	☐	☐

SP10g Power

Step	Learning outcome	Had a look	Nearly there	Nailed it!
5th	Define power and the units used to measure it. (energy transferred per second in watts)	☐	☐	☐
8th	Recall and use the equation to calculate the power, the energy transferred or the time taken. ($P = E/t$)	☐	☐	☐
6th	Explain how power transfer depends on the potential difference across a device and the current through it.	☐	☐	☐
8th	Recall and use the equation to calculate the electrical power, the current or the potential difference. ($P = I \times V$)	☐	☐	☐
8th	Recall and use the equation to calculate the electrical power, the current or the resistance. ($P = I^2 \times R$)	☐	☐	☐

SP10h Transferring energy by electricity

Step	Learning outcome	Had a look	Nearly there	Nailed it!
6th	Describe energy transfers from d.c. batteries and the a.c. mains supply to motors and heaters.	☐	☐	☐
6th	Explain the difference between direct and alternating voltage.	☐	☐	☐
6th	Compare alternating and direct current (in terms of movement of charge).	☐	☐	☐
5th	Recall the frequency and voltage of the UK domestic supply.	☐	☐	☐
6th	Describe the power ratings of some domestic electrical appliances and changes in stored energy when they are in use.	☐	☐	☐

SP10i Electrical safety

Step	Learning outcome	Had a look	Nearly there	Nailed it!
4th	Explain the difference between the functions of the live and the neutral wires.	☐	☐	☐
4th	Explain how circuit breakers make circuits safer.	☐	☐	☐
4th	Explain how the earth wire and the fuse make circuits safer.	☐	☐	☐
4th	Explain why switches and fuses are connected in the live wire.	☐	☐	☐
5th	Recall the potential differences between the live, neutral and earth wires.	☐	☐	☐
4th	Explain the danger of a connection between the live wire and earth.	☐	☐	☐

SP11 Static Electricity

SP11a Charges and static electricity

Step	Learning outcome	Had a look	Nearly there	Nailed it!
6th	Explain how rubbing an insulator transfers electrons.	☐	☐	☐
5th	Recall the charged particles found in an atom.	☐	☐	☐
7th	Explain why, when certain materials are rubbed together, they end up with opposite charges.	☐	☐	☐
5th	Recall the rules of attraction and repulsion between charges.	☐	☐	☐
7th	Explain how attraction by induction occurs.	☐	☐	☐

SP11b Dangers and uses of static electricity

Step	Learning outcome	Had a look	Nearly there	Nailed it!
5th	Describe what earthing is.	☐	☐	☐
6th	Explain how earthing works.	☐	☐	☐
7th	Explain how lightning occurs and why we sometimes get shocks from everyday objects.	☐	☐	☐
7th	Explain how electrostatic sprayers work.	☐	☐	☐
6th	Describe some hazards caused by charged objects discharging, and how earthing can be used to reduce risks.	☐	☐	☐

SP11c Electric fields

Step	Learning outcome	Had a look	Nearly there	Nailed it!
5th	Recall what an electric field is.	☐	☐	☐
5th	Recall how the direction of an electric field is defined.	☐	☐	☐
8th	Interpret information shown by field lines.	☐	☐	☐
9th	Describe the shape and direction of the electric field around a point charge and between charged electrical plates.	☐	☐	☐
10th	Explain how static electricity effects can be explained using the idea of an electric field.	☐	☐	☐