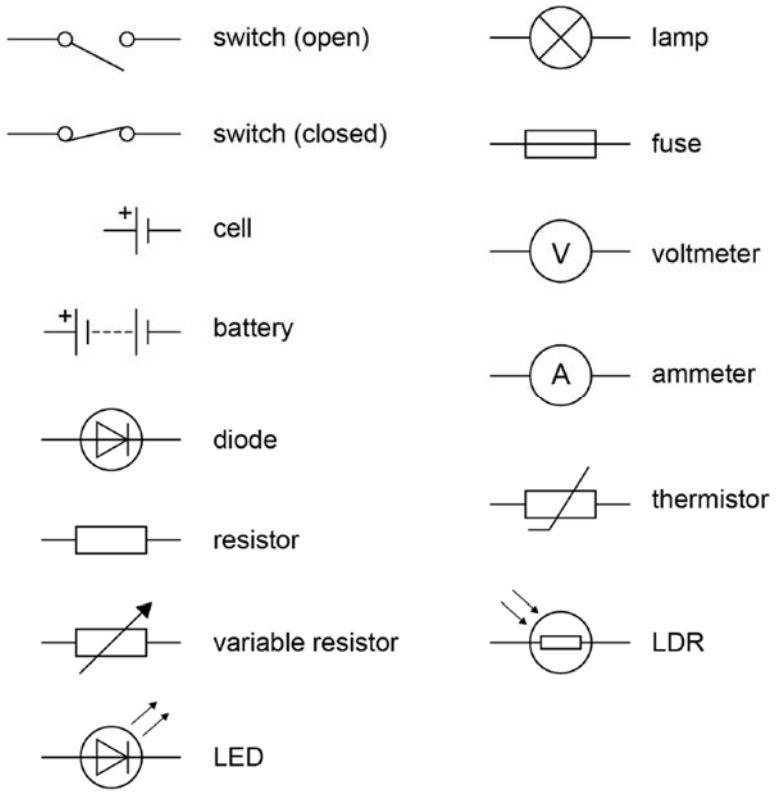
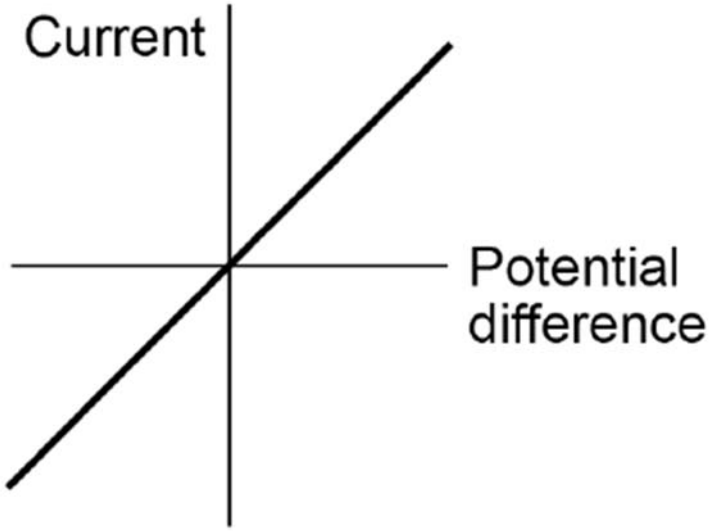
P3 Electric circuits

Lessons TBAT	Key Knowledge	Practical	Assessment
Identify and use the correct symbols in an electrical circuit Calculate the flow of charge in a circuit. Connect the current, potential difference and resistance of a circuit Identify what can change the resistance of a circuit Investigation how a change in temperature affects the resistance of a thermistor	6.2.1 Current, potential difference and resistance 6.2.1.1 Standard circuit diagram symbols Circuit diagrams use standard symbols.  Students should be able to draw and interpret circuit diagrams.	Required practical activity 15: 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. Investigate the relationship between the resistance of a thermistor and temperature. Investigate the relationship between the resistance of an LDR and light intensity. Required practical activity 16: 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.	Practical write up Maths focus

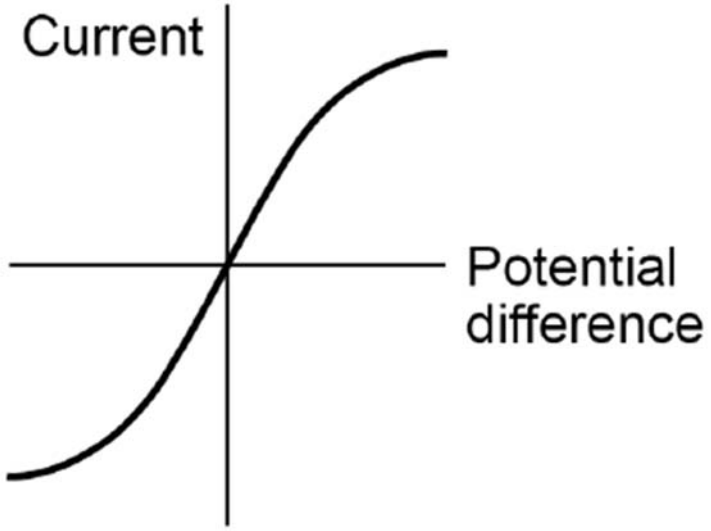
Investigate how a change in light intensity affects the resistance of a LDR Build a circuit to analysis I-V characteristics of different components. Build and describe the properties of a series and parallel circuits	6.2.1.2 Electrical charge and current For electrical charge to flow through a closed circuit the circuit must include a source of potential difference. Electric current is a flow of electrical charge. The size of the electric current is the rate of flow of electrical charge. Charge flow, current and time are linked by the equation: charge flow = current × time Q = I/t charge flow, Q, in coulombs, C current, I, in amperes, A (amp is acceptable for ampere) time, t, in seconds, s A current has the same value at any point in a single closed loop. 6.2.1.3 Current, resistance and potential difference The current (I) through a component depends on both the resistance (R) of the component and the potential difference (V) across the component. The greater the resistance of the component the smaller the current for a given potential difference (pd) across the component. Questions will be set using the term potential difference. Students will gain credit for the correct use of either potential difference or Voltage.	Key stage 3 Pupils should be taught to: • identify common appliances that run on electricity • construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers • identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit • recognise some common conductors and insulators, and associate metals with being good conductors

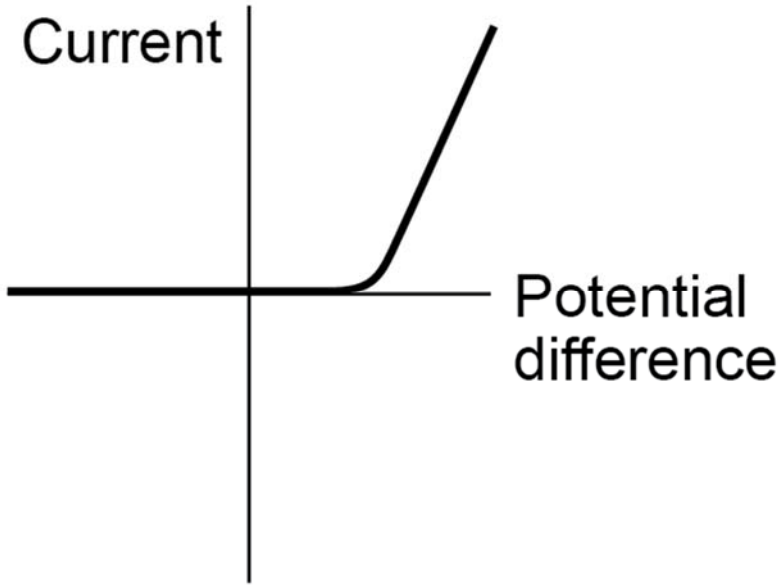
	Current, potential difference or resistance can be calculated using the equation: potential difference = current × resistance V = I R potential difference, V, in volts, V current, I, in amperes, A (amp is acceptable for ampere) resistance, R, in ohms, Ω 6.2.1.4 Resistors Students should be able to explain that, for some resistors, the value of R remains constant but that in others it can change as the current changes. The current through an ohmic conductor (at a constant temperature) is directly proportional to the potential difference across the resistor. This means that the resistance remains constant as the current changes.	



The resistance of components such as lamps, diodes, thermistors and LDRs is not constant; it changes with the current through the Component.

The resistance of a filament lamp increases as the temperature of the filament increases.

	 The current through a diode flows in one direction only. The diode has a very high resistance in the reverse direction.	



The resistance of a thermistor decreases as the temperature Increases.

The applications of thermistors in circuits eg a thermostat is Required.

The resistance of an LDR decreases as light intensity increases.

The application of LDRs in circuits eg switching lights on when it gets dark is required.

Students should be able to:

• explain the design and use of a circuit to measure the resistance of a component by measuring the current through,

	and potential difference across, the component • draw an appropriate circuit diagram using correct circuit symbols. Students should be able to use graphs to explore whether circuit elements are linear or non-linear and relate the curves produced to their function and properties. 6.2.2 Series and parallel circuits There are two ways of joining electrical components, in series and in parallel. Some circuits include both series and parallel parts. For components connected in series: • there is the same current through each component • the total potential difference of the power supply is shared between the components • the total resistance of two components is the sum of the resistance of each component. $R_{total} = R1 + R2$ resistance, R, in ohms, Ω For components connected in parallel: • the potential difference across each component is the same • the total current through the whole circuit is the sum of the currents through the separate components • the total resistance of two resistors is less than the resistance of the smallest individual resistor. Students should be able to: • use circuit diagrams to construct and check series and parallel circuits that include a variety of common circuit	

	components • describe the difference between series and parallel circuits • explain qualitatively why adding resistors in series increases the total resistance whilst adding resistors in parallel decreases the total resistance • explain the design and use of dc series circuits for measurement and testing purposes • calculate the currents, potential differences and resistances in dc series circuits • solve problems for circuits which include resistors in series using the concept of equivalent resistance. Students are not required to calculate the total resistance of two resistors joined in parallel.	

P3 Electric circuits