



Physics Scheme of Learning

P4: Electric Circuits

Intent – Rationale

This chapter of lessons is the first in the sequence on “Particles at Work” covering P4-Electric Circuits, P5-Electricity in the Home, P6 Molecules and matter and P7-Radioactivity.

All substances are made of atoms. Most atoms are stable and remain stable. Without this, the world as we know it wouldn’t exist, and neither would we.

Every atom contains a nucleus surrounded by tiny particles called electrons. Atoms can lose electrons, with different results. In this chapter we will consider how metals conduct electricity because they contain electrons that have broken away from atoms inside the metal. The key questions are: What is an electric current? How do series and parallel circuits differ?

Sequencing – what prior learning does this topic build upon?	Sequencing – what subsequent learning does this topic feed into?
<p>This chapter of lessons is the first in the sequence on “Particles at Work” covering P4-Electric Circuits, P5-Electricity in the Home, P6 Molecules and matter and P7-Radioactivity.</p> <p>KS3 Topic 1 - Energy KS3 Topic 3 – Electric Circuits GCSE Chapter P1-Conservation and dissipation of Energy</p>	<ul style="list-style-type: none"> The electricity you use at home is produced by generators in power stations and is used by electric motors in appliances such as washing machines. You will learn how generators and motors work in P15 Electromagnetism.
What are the links with other subjects in the curriculum?	What are the links to SMSC, British Values and Careers?
<ul style="list-style-type: none"> Technology - Electronics 	<ul style="list-style-type: none"> Discussion morals and ethics – heart transplant ADD code
What are the opportunities for developing literacy skills and developing learner confidence and enjoyment in reading?	What are the opportunities for developing mathematical skills?
<p>FROM THE LIBRARY</p> <p><i>Physics First</i>; G Bethall-530 <i>Electricity</i>; Louise Spilsbury-537 <i>Electronics</i>; R Bridgeman-621.38 <i>A Dictionary of Physics</i>; A Isaacs-530.03 <i>Energy</i>; Louise Spilsbury-530 <i>Introduction to Atomic and Nuclear Physics</i>; H Semat-539</p>	<ul style="list-style-type: none"> Mean average Algebra Standard form Unit prefixes Interpreting IV graphs Vectors fields (electric fields)



Physics Scheme of Learning

P4: Electric Circuits

Intent – Concepts

What knowledge will students gain and what skills will they develop as a consequence of this topic?	
<p><u>Know</u></p> <ul style="list-style-type: none"> • Understand what causes static electricity and how electrons can be transferred due to friction. Recognise the force between charged objects is a non-contact force. Be able to draw the electric field around a charged sphere. • Explain what current, potential difference and resistance are and use models to describe. Understand Ohm’s law. Understand how potential difference and current are distributed around a series and parallel circuit. Recognise the IV characteristics of different electrical components. • 	
<p><u>Apply</u></p> <ul style="list-style-type: none"> • Apply Ohm’s law to solve DC circuit problems for both series and parallel circuits. • Required practical activity 3: 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. • Required practical activity 4: 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. 	
<p><u>Extend</u></p> <ul style="list-style-type: none"> • Recognise the strengths and weaknesses of different models for electric circuits. 	
What subject specific language will be used and developed in this topic?	What opportunities are available for assessing the progress of students?
<ul style="list-style-type: none"> • diode - a non-ohmic conductor that has a much higher resistance in one direction (its reverse direction) than in the other direction (its forward direction) • electric field - a charged object (X) creates an electric field around itself, which causes a non-contact force on any other charged object in the field • electrons - tiny negatively charged particles that move around the nucleus of an atom • ion - a charged atom or molecule • light-dependent resistor (LDR) - a resistor whose resistance depends on the intensity of the light incident on it • light-emitting diode (LED) - a diode that emits light when it conducts • line of force in an electric field - line along which a free positive charge moves along in an electric field • neutrons - uncharged particles of the same mass as protons. The nucleus of an atom consists of protons and neutrons • Ohm’s law -the current through a resistor at constant temperature is directly proportional to the potential difference across the resistor • parallel - components connected in a circuit so that the potential difference is the same across each one • potential difference - a measure of the work done or energy transferred to the lamp by each coulomb of charge that passes through it. The unit of potential difference is the volt (V) • protons - positively charged particles with an equal and opposite charge to that of an electron • resistance - resistance (in ohms, Ω) = potential difference (in volts, V) \div current (in amperes, A) • series - components connected in a circuit in such a way that the same current passes through them • static electricity - electric charge stored on insulated objects 	<ul style="list-style-type: none"> • P4 Isaac Physics question – developing students’ mastery of application equations • P4 summative test – overall understanding of content and the ability to apply to unfamiliar contexts.



- thermistor - a resistor whose resistance depends on the temperature of the thermistor

Intent – Concepts

Lesson	Resources Booking	Physics Only	Text Book	Lesson Title	Learning Objectives	Resources
1	12x(Perspex and poly rods, dusters, hangers, clamp & stands) + Van de graff	Physics Only	P4.1	Static Electricity	I can explain insulating materials can become charged when rubbed together and electrons are transferred I can explain like charged objects repel, opposite charges attract	
1b	Van de graff generator and accessories	Physics Only	P4.1	Electric Fields	I can explain how static shock occurs when a charged object is earthed I can explain draw the electric field around a sphere I can explain why static electricity can be hazardous and how it can be made safe	
2			P4.2	Current and Charge	I can explain what an electric current is I can use the equation; $Q=IT$	



3	Ohms law, 12x(PSU, ammeter, voltmeter, rheostat, multimeter, 12v bulb)		P4.3	Potential Difference and Resistance	I can explain what is meant by potential difference (or voltage) I can explain what effect resistance has on current I can use Ohm's law ($V=IR$)	
4 (CP)	Core practical - Resistance of wire, 12x(wire on meter rule, ammeter, voltmeter, PSU)		R.Prac 3	Resistance of a wire	I can explain how to investigate the relationship between voltage and current in a circuit I can explain how the lengths of a wire effects its resistance	
5	Series circuits, 12x(2x 12v bulbs, ammeters, voltmeters, PSU, component holder, 3x 1k resistors, multimeter, 3x 'D' cell in holder)		P4.5	Series Circuits	I can explain how the current, potential difference, and resistance for series circuits affect each other I can explain how to calculate the potential difference of several cells in series	
6	Parallel circuits, 12x(2x 12v bulbs, ammeters, voltmeters, 15 ohm rheostats, PSU)		P4.6	Parallel Circuits	I can recognise how potential difference and current is distributed in a parallel circuit I can explain the effect of placing	



					resistors in parallel on total resistance	
6b			P4.5&6	Electricity Summary	I can use Ohm's Law to solve circuit problems	
7a (CP)	Core Practical - Component characteristics - 12x(100ohm(high power) resistor, ammeter, multimeter)		R.Prac 4	IV Characteristics of a Resistor	I can recognise the Current – Voltage (IV) characteristics of a resistor	
7b (CP)	Core Practical - Component characteristics - 12x(ammeter, voltmeter, 500 ohm resistor, diode)		R.Prac 4	IV Characteristics of a Diode	I can recognise the Current – Voltage (IV) characteristics of a diode	
7c (CP)	Core Practical - Component characteristics - 12x(ammeter, voltmeter, 12v bulb)		R.Prac 4	IV Characteristics of a Bulb	I can recognise the IV characteristics of a bulb	
8	Sensor circuits, 12x(Multimeter, Thermistors, LDR, component holders, resistors, 200ml beaker) 2 x kettles		P4.4	The Thermistor and LDR	I understand how the resistance of a thermistor and light dependant resistor (LDR) change with temperature and light levels	
Test	Class set of test				Summative assessment	