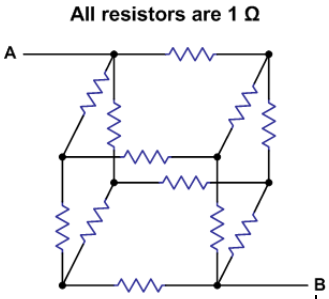
Scheme of Work 2020 – 2021 (HT5)
Subject: AS Physics

Year Group: 12
Specification: AQA 7407

Lesson No	Topic & Objectives	Big Question – What will students learn?	Key Activities & Specialist Terminology (Do Now Task / Starter/Tasks/Plenary	Planned Assessment	Homework or flipped learning resources DODDLE resources	Lit Num SMSC Codes
3.5.1 Current electricity	Electric current is the rate of flow of charge. Potential difference is the work done per unit charge. The definition of resistance.	• Recognise that current is the rate of flow of charge. • Recognise that potential difference is the work done per unit charge. • Recognise the equation defining resistance and can apply it in calculations.	**Learning activity:** • Review current as a flow of charge and practice calculations. • Review potential difference is the work done per unit charge and practice calculations. • Practise resistance calculations. **Skills developed by learning activities:** AO1: Demonstration of knowledge and understanding of electric current, potential difference and resistance. AO2: Apply knowledge and understanding of electric current, potential difference and resistance	PHYA1 May 2012 Q7 PHYA1 Jan 2012 Q5(a)	http://hyperphysics.phy-astr.gsu.edu/hbase/electric/elecur.html	C3
3.5.1.2 Current-voltage characteristics	current – voltage characteristics for an ohmic conductor, a semiconductor diode and a filament lamp.	• Interpret current – voltage graphs and distinguish between the characteristics for an ohmic conductor, a semiconductor diode and a filament lamp. Recognise that Ohm's law is a special case for a component with constant resistance	**Learning activity:** • Investigate current – voltage graphs for an ohmic conductor, a semiconductor diode and a filament lamp. • Give examples of current – voltage graphs and explain how they should be interpreted. • Explain Ohm's Law and outline why it is a special case. **Skills developed by learning activities:**		http://hyperphysics.phy-astr.gsu.edu/hbase/electric/ohmlaw.html	C3

	Ohm's law as a special case where current is directly proportional to voltage under constant physical conditions.		AO1: Demonstration of knowledge and understanding of current-voltage characteristics of various components. AO2: Apply knowledge and understanding of current-voltage characteristics. MS3.2: Plot current voltage characteristics. PS3.1: Plot and interpret current-voltage graphs. ATb: Use digital meters. ATf: Construct and check circuits.			
3.5.1.3 Resistivity	Resistivity, $\rho = \frac{RA}{L}$ Experiment to determine the resistivity of a wire. Description of the qualitative effect of temperature on the resistance of metal conductors. The effect of	• Define resistivity and use the resistivity equation in calculations. • Describe an experiment to determine the resistivity of a wire. • Describe the effect of temperature on the resistance of metal conductors. • Describe the effect of temperature on a negative temperature coefficient thermistor. • Describe application of thermistors including temperature sensors. • Explain what is meant by a superconductor. • Describe how superconductors can	**Learning activity:** • Define resistivity and practise using the definition in calculations. • Determine the resistivity of the metal in a wire. • Explain how temperature affects the resistance of metal conductors. • Explain how temperature affects the resistance of a thermistor. • Investigate applications of thermistors. • Explain what is meant by superconductivity and explain the significance of critical temperature. • Investigate some of the uses of superconductors. **Required practical** Determination of resistivity of a wire using a micrometer, ammeter and voltmeter. **Skills developed by learning activities:**	PHYA1 May 2014 Q6 PHYA1 Jan 2013 Q7(a) PHYA1 Jan 2012 Q5(b)	http://phet.colorado.edu/en/simulation/resistance-in-a-wire http://hyperphysics.phy-astr.gsu.edu/hbase/electric/resis.html https://teachers.web.cern.ch/teachers/archiv/HST2001/accelerators/superconductivity/superconductivity.htm	C3 C3 C3

	temperature on a negative temperature coefficient thermistor. Application of thermistors in temperature sensors. Superconductivity as a property of certain materials which have zero resistivity at or below the critical temperature. Applications of superconductors.	be used to produce strong magnetic fields and to reduce energy losses in the transmission of electric power.	AO1: Demonstration of knowledge and understanding of resistivity. AO2: Apply knowledge and understanding of resistivity in calculations. MS4.3: Calculate cross-sectional areas of wires. MS3.2: Plot a graph of voltage against current. ATe: Use micrometers to measure diameters of wires. ATb: Use multimeters. PS2.1: Apply scientific knowledge set in a practical context. PS4.1: Know and use a wide range of practical equipment to determine the resistivity of the metal in a wire.			
3.5.1.4 Circuits	Combining resistors in series and in parallel. The relationship between currents, voltages	• Calculate the total resistance for combinations of series and parallel resistors. • Analyse series and parallel circuits. • Analyse circuits involving combinations of cells in series and	**Learning activity:** • Explain how resistance in series and resistances in parallel combine. • Explain why the total resistance of a parallel combination of resistors is always less than the smallest resistance resistor in the combination.	PHYA1 May 2014 Q5 PHYA1 Jan 2013 Q6 and Q7(b) PHYA1 Jan 2012 Q6 PHYA1 Jun 2012 Q6	http://www.tap.iop.org/electricity/circuits/index.html	C3

	and resistances in series and parallel circuits. Cells in series and identical cells in parallel. The energy and power equations: *E=VIt* $P = VI$ $= I^2R = \frac{V^2}{R}$ The conservation of charge and energy in dc circuits.	identical cells in parallel. • Calculate the energy and power in electric circuits. Explain how energy and charge are conserved in electric circuits.	• Practise calculations involving series and parallel arrangements of components. • Outline how the cells in series and in parallel combine. • Review the power and energy equations and practise calculations involving these. • Demonstrate how energy and charge are conserved in electric circuits. **Skills developed by learning activities:** AO1: Demonstration of knowledge and understanding of series and parallel electric circuits. AO2: Apply knowledge and understanding in the analysis of electric circuits. ATb, f: Construct circuits from a range of components. MS0.3: Use fractions when combining resistors in parallel. PS4.1: Know and understand how to use a wide range of experimental and practical instruments when investigating circuit.		**Rich question:** What is the resistance between A and B?  	
3.5.1.5 Potential divider	The potential divider used to supply constant or variable potential difference from a	• Demonstrate that they understand how a potential divider can provide a constant or variable potential difference from a power supply. • Describe how variable resistors, light dependent	**Learning activity:** • Investigate potential divider circuits. • Investigate how sensors can be used in potential divider circuits. **Skills developed by learning activities:** AO1: Demonstration of knowledge and understanding of the potential divider.	SAM Q5 PHYA1 May 2014 Q7 PHYA1 May 2013 Q7 PHYA1 May 2012 Q7	http://tap.iop.org/electricity/circuits/118/page_46038.html	C3

	power supply. The use of variable resistors, light dependent resistors and thermistors in potential divider circuits.	resistors and thermistors can be used in potential divider circuits.	AO2: Apply knowledge and understanding of using potential dividers in sensing circuits. MS0.3: Use ratios and fractions when analysing potential divider circuits. MS2.3: Substitute numerical values into the potential divider equation. PS4.1: Know and understand how to use a wide range of experimental and practical instruments when investigating potential divider circuits. ATf, g: Correctly design, connect and check circuits.			
3.5.1.6 Electro motive force and internal resistance	The definition of emf. Circuit equation when cells have appreciable internal resistance. $\in = I(R + r)$ Terminal pd.	• Define emf with reference to cells. • Understand and perform calculations for circuits in which the internal resistance of the supply is not negligible. Explain what is meant by terminal pd.	**Learning activity:** • Explain what is meant by emf, internal resistance and terminal pd. • Practise calculations using the equation $\in = I(R + r)$ • Determine the internal resistance of a cell by measuring the terminal pd when the cell is connected to an external resistor with variable resistance. **Required practical** Investigation of the emf and internal resistance of electric cells and batteries by measuring the variation of the terminal pd of the cell with current in it. **Skills developed by learning activities:** AO1: Demonstration of knowledge and understanding of emf and internal resistance.	PHYA1 May 2013 Q6 PHYA1 Jan 2012 Q7	http://www.tap.iop.org/electricity/emf/index.html http://www.nuffieldfoundation.org/practical-physics/internal-resistance-potato-cell **Rich question:** Why is it important for car batteries to have very low internal resistances	C3

			AO2: Apply knowledge and understanding of emf and internal resistance in circuit calculations. MS3.1: Translate data from experiments to determine internal resistance into graphical form. MS3.3: Understand that the circuit equation including emf and internal resistance represents a linear relationship. MS3.4: Determine the intercept and slope of a linear graph. PS2.2: Present data from experiments to determine internal resistance in appropriate ways. PS3.1: Plot and interpret the graph from experiments to determine internal resistance. ATf: Correctly construct circuits for experiments to determine internal resistance.			