PHYA1 3.1.3

Current electricity

AS Physics:

what you need to know

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| **Charge, current and potential difference** | I can do this already | Covered in class | Strength | Weakness | I have  revised this | Book references |
| I can define the term **electric current**. |  |  |  |  |  | AQA: 46;  APfY: 191 |
| I can recall and use the equation for electric current ( , where *I* is current, *ΔQ* is charge transferred, and *Δt* is the time interval). |  |  |  |  |  | AQA: 46;  APfY: 192 |
| I can define the term **potential difference**. |  |  |  |  |  | AQA: 194 |
| I can recall and use the equation for potential difference ( , where *V* is potential difference, *W* is the work done on or by the charge, and *Q* is the charge transferred). |  |  |  |  |  | AQA: 48; APfY: 194 |
| I can define **resistance** as . |  |  |  |  |  | AQA: 50;  APfY: 196 |
| I can explain what is meant when a conductor is described as **ohmic**. |  |  |  |  |  | APfY: 196 |
| I can recall the units for electric current, potential difference and resistance. |  |  |  |  |  | AQA: 46 - 48;  APfY: 192, 194 & 196 |

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| **Current-voltage characteristics** | | | | | | |
| I can describe an experiment to determine the I-V characteristics of an ohmic conductor, a semiconductor diode, and a filament lamp. |  |  |  |  |  | AQA: 51;  APfY: 198 |
| I can sketch the **I-V characteristic curves** for an ohmic conductor, a semiconductor diode, and a filament lamp. |  |  |  |  |  | AQA:51 & 54;  APfY: 198 |
| I can explain the **I-V characteristic curves** of an ohmic conductor, a semiconductor diode, and a filament lamp. |  |  |  |  |  | AQA:51 & 54;  APfY: 198 |
| I can state **Ohm’s law**. |  |  |  |  |  | AQA: 51; APfY: 196 |

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| **Resistivity** | | | | | | |
| I can state the defining equation for **resistivity** ( , where *ρ* is resistivity, *R* is resistance, *A* is cross-sectional area, and *l* is length). |  |  |  |  |  | AQA: 51;  APfY: 197 |
| I can describe the **effect of temperature on the resistance** of a metal conductor, and on a NTC thermistor. |  |  |  |  |  | AQA: 55;  APfY: 199 |
| I can describe the use of thermistors in temperature sensors. |  |  |  |  |  | AQA: 71 |
| I can explain what is meant by the term **superconductivity**. |  |  |  |  |  | AQA: 52;  APfY: 199 |
| I can describe some technological applications of superconductivity. |  |  |  |  |  | AQA: 52 |

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| **Circuits** | | | | | | |
| I can state **Kirchhoff’s first law** and explain that it is a consequence of **conservation of charge**. |  |  |  |  |  | AQA:58; APfY: 206 |
| I can state **Kirchhoff’s second law** and understand that it is an example of the principle of **conservation of energy**. |  |  |  |  |  | AQA:58 - 60; APfY: 213 |
| I can apply Kirchhoff’s first and second laws to circuits. |  |  |  |  |  | APfY: 206 & 207 |
| I can select and use the equation for the total resistance of two for more **resistors in series** (Rtotal = R1 + R2 + … ) . |  |  |  |  |  | AQA: 61;  APfY: 208 |
| I can select and use the equation for the total resistance of two for more **resistors in parallel** (1/Rtotal = 1/R1 + 1/R2 + … ). |  |  |  |  |  | AQA: 61 & 62;  APfY: 209 |
| **Circuits** continued | I can do this already | Covered in class | Strength | Weakness | I have  revised this | Book references |
| I can select and use the equation **E = IVt** (electrical energy transferred = current x p.d. x time). |  |  |  |  |  | AQA: 49;  APfY: 195 |
| I can describe **power** as the rate at which energy is transferred. |  |  |  |  |  | AQA: 49;  APfY: 200 |
| I can select and use the power equations **P = VI**, **P = I2R** and **P = V2/R**. |  |  |  |  |  | AQA: 49, 62 & 64; APfY: 200 |
| I can solve series and parallel circuit problems which have one or more sources of e.m.f.. |  |  |  |  |  | AQA: 67 - 69; APfY: 215 |

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| **Potential divider** | | | | | | |
| I can draw a simple **potential divider** circuit. |  |  |  |  |  | AQA: 70;  APfY: 210 |
| I can explain how a potential divider circuit can be used to produce a variable p.d.. |  |  |  |  |  | AQA: 70, 24 & 25; APfY: 211 |
| I can recall and use the potential divider equation **Vout = [ V2/(R1 + R2) ] x Vin** |  |  |  |  |  | AQA: 70; APfY: 210 |
| I can describe how the resistance of a **light dependent resistor** (LDR) depends on the intensity of light. |  |  |  |  |  | AQA: 71; APfY: 203 |
| I can describe and explain the use of **variable resistors**, **thermistors** and **light dependent resistors** (LDRs) in potential divider circuits. |  |  |  |  |  | AQA: 70 & 71; APfY: 210 |
| I can describe practical applications of potential divider circuits, e.g. a volume control. |  |  |  |  |  | AQA: 71; APfY: 211 |

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| **Electromotive force and internal resistance** | | | | | | |
| I can define the term **electromotive force** (e.m.f.). |  |  |  |  |  | AQA: 25; APfY: 212 |
| I can recall and use the defining equation for e.m.f., **ε = E/Q**, where *ε* is e.m.f., *E* is the energy transferred, and *Q* is charge. |  |  |  |  |  | AQA: 64; APfY: 212 |
| I can explain that all sources of e.m.f. have an **internal resistance**. |  |  |  |  |  | AQA: 64; APfY: 362 |
| I can explain the meaning of the term **terminal p.d**.. |  |  |  |  |  | APfY: 213 |
| I can select and use the equations **ε= I(R + r)** where *I* is current, *R* is external resistance, and *r* is internal resistance. |  |  |  |  |  | AQA: 64; APfY: 213 |
| I can apply the concept of internal resistance to practical situations (e.g. car batteries). |  |  |  |  |  | AQA: 25; APfY: 215 |

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| **Alternating currents** | | | | | | |
| I can explain what is meant by an alternating current (a.c.). |  |  |  |  |  | AQA: 74; APfY: 242 |
| I can sketch graphs of alternating voltage and current against time. |  |  |  |  |  | AQA: 74; APfY: 242 |
| I can explain what is meant by **root mean square** (r.m.s.) and calculate the r.m.s. values of an alternating current and voltage. |  |  |  |  |  | AQA: 76; APfY: 243 |
| I can calculate the power delivered by an alternating current. |  |  |  |  |  | AQA: 75 & 76; APfY: 243 |

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| **Oscilloscope** | | | | | | |
| I understand that an oscilloscope displays a voltage vs time graph. |  |  |  |  |  | AQA: 77; APfY: 244 |
| I can use an oscilloscope to measure d.c. and a.c. voltages. |  |  |  |  |  | AQA: 78; APfY: 245 |
| I can use an oscilloscope to measure **time intervals** and to determine the **frequency** of an alternating voltage. |  |  |  |  |  | AQA: 78; APfY: 245 |

**Book references:** AQA = ***AQA Physics A*** by Breithaupt (Pub. Nelson Thornes) – the AQA endorsed textbook

APfY =***Advanced physics*** *for you* by Johnson, Hewett, Holt and Miller (Pub. Nelson Thornes)