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| OCR Physics A  Module 4A : Electricity | Module RAG sheet |

Use this sheet to track and review your learning and revision.

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| **4.1** | **Charge and current** | RAG1 | RAG2 | RAG3 |
| **4.1.1** | **Charge** |  |  |  |
| (a) | electric current as rate of flow of charge; *I = ΔQ/Δt* |  |  |  |
| (b) | the coulomb as the unit of charge |  |  |  |
| (c) | the elementary charge *e* equals 1.6 × 10−19 C  Learners will be expected to know that an electron has charge −*e* and a proton a charge +*e*. |  |  |  |
| (d) | net charge on a particle or an object is quantised and a multiple of |  |  |  |
| (e) | current as the movement of electrons in metals and movement of ions in electrolytes |  |  |  |
| (f) | conventional current and electron flow |  |  |  |
| (g) | Kirchhoff’s first law; conservation of charge. |  |  |  |
| **4.1.2** | **Mean drift velocity** |  |  |  |
| (a) | mean drift velocity of charge carriers |  |  |  |
| (b) | *I* = *nAve*, where *n* is the number density of charge carriers |  |  |  |
| (c) | distinction between conductors, semiconductors & insulators in terms of *n*. |  |  |  |
|  |  |  |  |  |
| **4.2** | **Energy, power and resistance** | RAG1 | RAG2 | RAG3 |
| **4.2.1** | **Circuit symbols** |  |  |  |
| (a) | circuit symbols   |  | | --- | | As set out in ASE publication *Signs, Symbols and Systematics (The ASE Companion to 16–19 Science, 2000).* | |  |  |  |
| (b) | circuit diagrams using these symbols. |  |  |  |
| **4.2.2** | **E.m.f. and p.d.** |  |  |  |
| (a) | potential difference (p.d.); the unit volt |  |  |  |
| (b) | electromotive force (e.m.f.) of a source such as a cell or a power supply |  |  |  |
| (c) | distinction between e.m.f. and p.d. in terms of energy transfer |  |  |  |
| (d) | energy transfer; *W = VQ*; *W =* E*Q* |  |  |  |
| (e) | energy transfer *eV* = ½ *mv*2 for electrons and other charged particles. |  |  |  |
| **4.2.3** | **Resistance** |  |  |  |
| (a) | resistance; *R = V/I* ; the unit ohm  Learners will also be expected to recall this equation. |  |  |  |
| (b) | Ohm’s law |  |  |  |
| (c)(i) | *I*–*V* characteristics of resistor, filament lamp, thermistor, diode and light-emitting diode (LED) |  |  |  |
| (c)(ii) | techniques and procedures used to investigate the electrical characteristics for a range of ohmic and non-ohmic components.  **Investigating components and analysing data using spreadsheet.** |  |  |  |
| (d) | light-dependent resistor (LDR); variation of resistance with light intensity. |  |  |  |
| **4.2.4** | **Resistivity** |  |  |  |
| (a)(i) | resistivity of a material; the equation *R = ρl/A* |  |  |  |
| (a)(ii) | techniques and procedures used to determine the resistivity of a metal. |  |  |  |
| (b) | the variation of resistivity of metals and semiconductors with temperature |  |  |  |
| (c) | negative temperature coefficient (NTC) thermistor; variation of resistance with temperature. |  |  |  |
| **4.2.5** | **Power** |  |  |  |
| (a) | the equations *P = V I* ,*P = I2 / R* and *P = V2 R* |  |  |  |
| (b) | energy transfer; *W* = *V I t* |  |  |  |
| (c) | the kilowatt-hour (kW h) as a unit of energy; calculating the cost of energy. |  |  |  |
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| **4.3** | **Electrical circuits** | RAG1 | RAG2 | RAG3 |
| **4.3.1** | **Series and parallel circuits** |  |  |  |
| (a) | Kirchhoff’s second law; the conservation of energy |  |  |  |
| (b) | Kirchhoff’s first and second laws applied to electrical circuits |  |  |  |
| (c) | total resistance of two or more resistors in series; *R* = *R*1 + *R*2 + … |  |  |  |
| (d) | total resistance of two or more resistors in parallel; 1/*R = 1/R1 + 1/R2 + …* |  |  |  |
| (e) | analysis of circuits with components, including both series and parallel |  |  |  |
| (f) | analysis of circuits with more than one source of e.m.f. |  |  |  |
| **4.3.2** | **Internal resistance** |  |  |  |
| (a) | source of e.m.f.; internal resistance |  |  |  |
| (b) | terminal p.d.; ‘lost volts’ |  |  |  |
| (c)(i) | the equations *E = I(R + r)* and *E = V + Ir* |  |  |  |
| (c)(ii) | techniques and procedures used to determine the internal resistance of a chemical cell or other source of e.m.f.  **Investigating the internal resistance of a power supply.** |  |  |  |
| **4.3.3** | **Potential dividers** |  |  |  |
| (a) | potential divider circuit with components  Learners will also be expected to know about a potentiometer as a potential divider. |  |  |  |
| (b) | potential divider circuits with variable components e.g. LDR and thermistor |  |  |  |
| (c)(i) | potential divider equations e.g.  *V1 / V2 = R1 / R2* |  |  |  |
| (c)(ii) | techniques and procedures used to investigate potential divider circuits which may include a sensor such as a thermistor or an LDR.  **Designing temperature and light sensing circuits.** |  |  |  |