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| **Lesson Number: 23.3a** | | |
| **Lesson Title: Investigation of the charge and discharge of capacitors**  **Required Practical 9** | | |
| **Specification Reference** | | **3.7.4.4** |
| **Learning Objectives** | | |
| Graphical representation of charging and discharging of capacitors through resistors.  Corresponding graphs for *Q*, *V* and *I* against time for charging and discharging.  Time constant *RC*.  Calculation of time constants including their determination from graphical data.  Quantitative treatment of capacitor discharge,  Use of the corresponding equations for *V* and *I*.  Quantitative treatment of capacitor charge, | | |
| **Opportunities for Assessment** | | |
| Assessing the practical aspect of the lesson  **Skills Assessment (Required practical 9)**  AT (b),(f),(g),(h),(k) – Note that (h) requires oscilloscope usage and would better be demonstrated and then let students use the equipment in a separate lesson | | |
| **Starter:** | Recap capacitor charging and discharge from last lesson (Slides #1 and #2) | |
| **Main:** | Slide #3 explains to students that their teacher will decide how much dependence they are given in this experiment. See pages 61 and 62 of the AQA practical handbook for Physics for full details  Slide #4 outlines the assessed skills that will be looked at by the teacher. Students should keep these in mind and ensure that their teacher watches them perform these skills during the practical.  Depending on the outcomes that the teacher wishes to assess, the pupils can either be given a method to follow or a lesson can be used as a full research and planning session  The experiment needs to be performed. See pages 96 to 99 of the practical handbook for A-Level Physics for full details. | |
| **Plenary:** | Go over the experiment and the results; write up the experiment in full; discuss the assessing of the skills and the outcome assessed by the teacher. | |

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| **Homework:** | Write up the experiment | |
| **Differentiation / Extension / S&C** | | |
| Assistance / guidance on the planning of the experiment can be altered for group’s ability | | |
| **Numeracy / Literacy** | | **SMSC / Fundamental British Values** |
| Use of natural logs and exponential formulae | | Team work in a practical lesson  Understanding other people’s opinions and ideas in the planning of the experiment |
| **RESOURCES:**  PRACTICAL 9 - AQA Notes and Method – (1 copy unless specified additional methods) | | |
| Per group:   * Stop-clock * electrolytic capacitors ( suitable values: 1000µF, 2200µF, 4700µF) * resistors (0.25W carbon film, values in the range 10kΩ to 100kΩ) * battery 3V, 6V or 9V * digital voltmeter, range 0 – 10V * SPDT (single pole double throw) switch * connecting leads | | |
| **Risk Assessment** e.g. CLEAPSS card reference | | |
| Ensure that capacitors are connected the correct polarity when charging  Resistors can get hot if a current is accidently run through them instead of charging a capacitor | | |
| **Working Scientifically (HSW)** | | |
| Assessed practical and write-up | | |