PAG 9.1 Discharge of a Capacitor and Timer Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

12V

V

Stopwatch

12V DC Power Supply

470 μF capacitor rated to at least 16V

Resistance box covering range of around 100kΩ to 470kΩ

Multi-meter set to 20V DC

Red and Black leads.

Without connecting the positive terminal of the power supply.

Connect up all the electrical components in parallel ensuring the correct polarity of the capacitor. **Check the polarity of the capacitor again. It may explode if it’s wrong.**

Set the resistance box to 470kΩ (or as close to this as possible)

Connect the supply and wait for the p.d. across the capacitor to settle.

Start the stopwatch as you unplug the positive of the power supply.

Record the potential difference across the capacitor as it discharges through the resistor in a suitably formatted table with appropriate headings and units in Excel.

Plot a graph in of p.d. against time in Excel.

Fit an exponential curve to the data and display the equation of the line of best fit on the chart.

Use the equation to determine the time constant for the RC pair.

Repeat the experiment for R = 220kΩ and 100kΩ adding the data and lines of best fit to the same graph.

Your challenge is then to use an RC circuit to time an interval of between 30s and 120s which will be given to you a few minutes before the timing challenge.

**Practical Skills**

* 1.2.1(a) apply investigative approaches
* 1.2.1(b) safely and correctly uses a range of practical equipment and materials
* 1.2.1(c) follow written instructions
* 1.2.1(d) makes and records observations
* 1.2.1(e) keep appropriate records of experimental activities
* 1.2.1(f) present information and data in a scientific way
* 1.2.1(g) use appropriate software and tools to process data
* 1.2.1(j) use a wide range of instruments, equipment and techniques
* 1.2.2(b) use of appropriate digital instruments including multimeters
* 1.2.2(f) correctly construct circuits from circuit diagrams
* 1.2.2(k) use of ICT such as data logger or software to process data

**CPAC**

* (2) Applies investigative approaches
* (3) Safely uses a range of practical equipment and materials
* (4) Makes and records observation