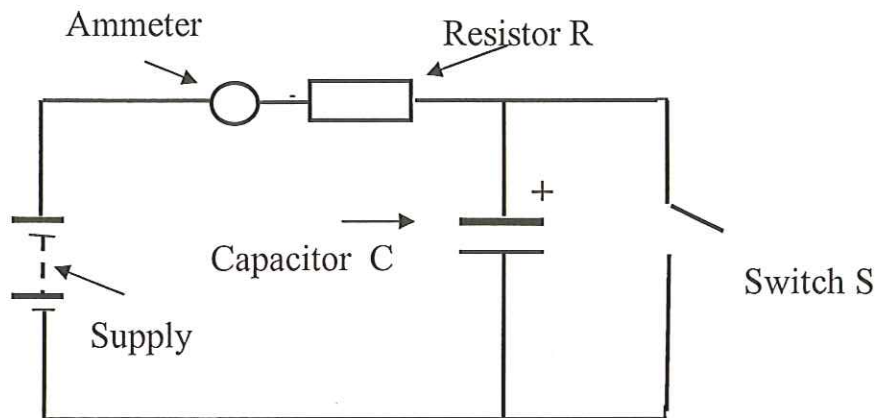


Name _____

DC 3 Charging a Capacitor



Additional equipment. A stop-watch

This experiment must be done in pairs

Theory.

It can be shown that the charging current I for a resistor-capacitor circuit is given by the expression

$$I = I_0 e^{\frac{-t}{RC}}$$

where R is the resistance, C is the capacitance, I_0 is the initial charging current and t is time elapsed since the capacitor began charging.

Important. It is vital that the capacitor is connected the right way round.
Have your circuit checked before you switch on.

Procedure

- Rearrange the above equation into an appropriate linear form.
- Close the switch S to ensure that the capacitor is completely discharged.
- Check that the micro-ammeter is reading a steady current of about $30 \mu\text{A}$.
- Prepare a table to accept values of charging current I (in μA), time t in seconds and, a further column for $\ln I$.
- When you are ready, open the switch and, at the same time, start the clock.
- Take readings of the charging current I at appropriate time intervals t .
- Plot a graph of $\ln I$ against t .
- Use the graph to find a value for the *time constant* of the circuit ie RC .
- Read the value of the resistor and find the value of the capacitance C .
- Write a short report on your findings.