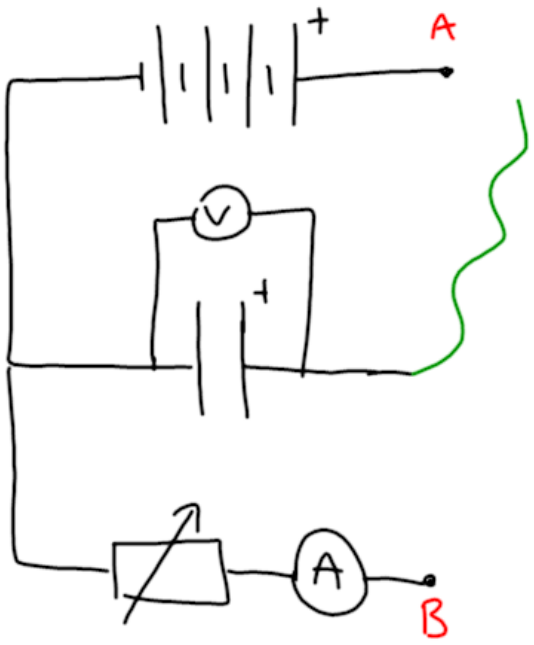
Discharging a capacitor through a resistor

You are provided with the following circuit:



The variable resistor can be altered by rotating the wheel.

The green lead is called a 'flying lead' – it can be connected to the cells to charge the capacitor (point A). When it is connected to point B (at the ammeter) the capacitor discharges through the resistor.

Note that the capacitor does not charge through the resistor, so it charges almost instantly, but it discharges through the resistor, which takes much longer.

Charge the capacitor by connecting the flying lead to A then disconnecting. Then simultaneously connect the flying lead to B and start the timer. Watch the current and voltage readings for one minute. Ensure the voltmeter and ammeter are on the most appropriate sensitivity setting for this range of readings.

Charge the capacitor again, then discharge it and collect data for how the voltage varies over one minute. Then repeat the procedure to record the current over one minute.

t /s
10
20
30
40
50
60

You should also record the capacitance of the capacitor, and the resistance setting of the resistor wheel:

C = R =

One person should plot a graph of voltage against time, and the other should plot a graph of current against time. You can then photocopy each other's graphs.

The graphs should resemble exponential decay – something you have seen with radioactive decay. Think about the properties that a radioactive decay curve has, and see if your graph has the same properties.

The 'time constant' for your capacitor discharge is R x C. It is also the time it takes for the voltage (or the current) to fall by a factor of 1/e (which is approx. 0.37).

Calculate the time constant using R x C and then calculate it by reading off from your graph, and compare the two results.

Time constant (RC) =

Time constant (graph) =