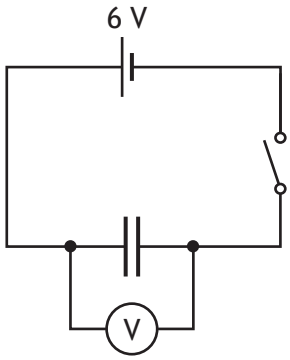
13. A student uses the circuit shown to determine the capacitance of a capacitor.



The capacitor is initially uncharged. The student closes the switch and the capacitor charges fully.

The student then measures the charge stored on the capacitor using a coulombmeter.

The student records the following measurements:

potential difference across the capacitor (5.7 ± 0.1) V;

charge stored on the capacitor (136.8 ± 0.1) mC.

(a) (i) Using these measurements, calculate the capacitance of the capacitor. **3**

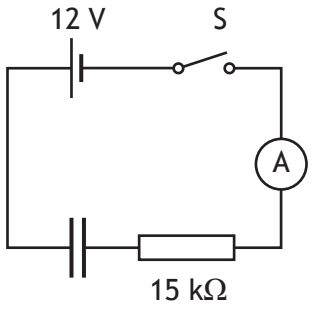
Space for working and answer

13. (a) (continued)

(ii) Determine the **absolute** uncertainty in the capacitance of the capacitor. **3**

Space for working and answer

(b) The student discharges the capacitor and then connects it in the circuit shown.



The student closes switch S and the capacitor charges.

The time t taken for the capacitor to charge fully can be estimated using the relationship

$$t = 5RC$$

where the symbols have their usual meaning.

Calculate the estimated time taken for the capacitor to charge fully. **2**

Space for working and answer