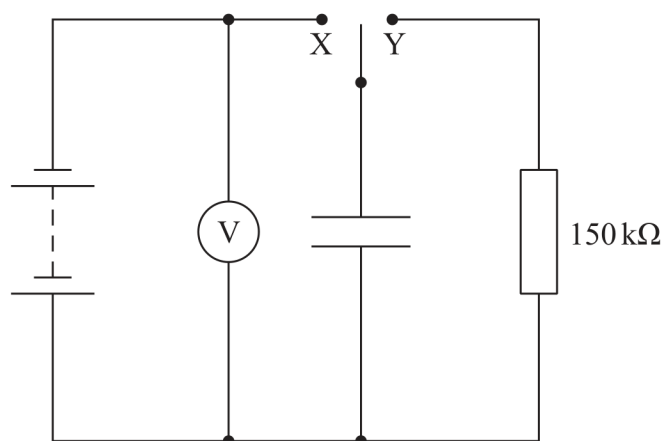


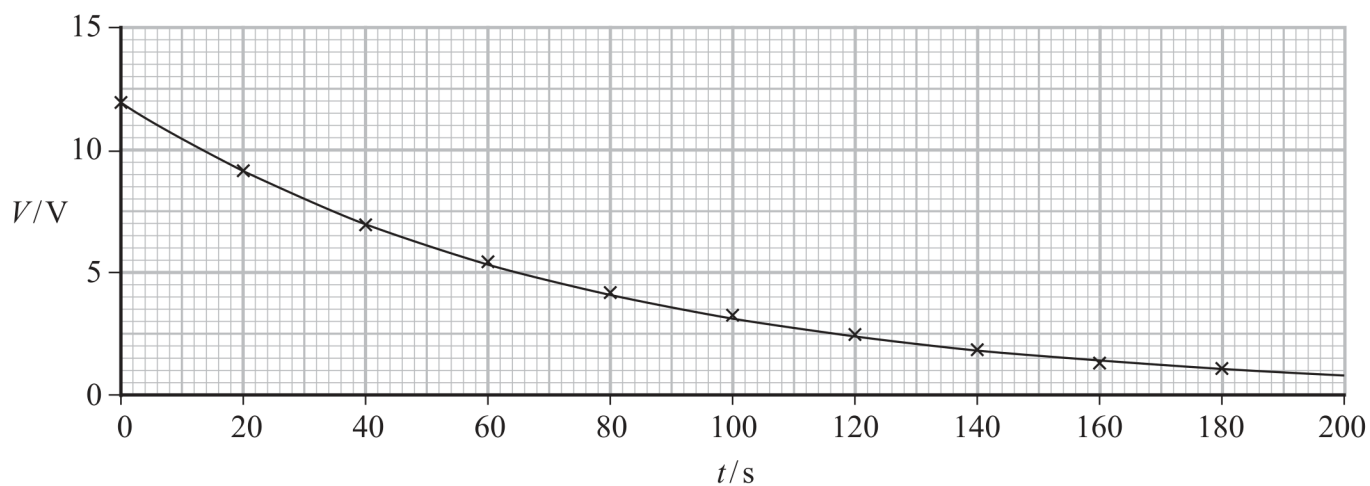
18 A student used the circuit shown to determine the capacitance of a capacitor.



The student connected the switch to X to charge the capacitor. She then connected the switch to Y so that the capacitor discharged through the $150\text{ k}\Omega$ resistor.

The student started a stopwatch when she connected the switch to Y and recorded the voltmeter reading V every 20 s as the capacitor discharged.

The graph shows how V varied with time t .



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- (a) The capacitor is labelled as $470\text{ }\mu\text{F}$, with a tolerance of $\pm 10\%$.

Evaluate whether the capacitance of the capacitor is within the stated tolerance.

(4)

- (b) An ultracapacitor is a high-capacity capacitor.

One ultracapacitor has a capacitance of 47 F . The maximum charge this capacitor can store is 56 C .

It is suggested that this capacitor could store 1000 times as much energy as a $470\text{ }\mu\text{F}$ capacitor charged to a potential difference of 12 V .

Assess the validity of this suggestion.

(3)