



## A. Key Concepts

- Describe how the current and potential difference of a resistor **and** a capacitor change while charging/discharging in a RC circuit.
- What is the time constant of a RC circuit? How do you calculate the time constant?
- At what time is a capacitor considered to be fully charged / discharged?
- What is capacitive reactance? What equations have you learned for capacitive reactance?
- What effect does an inductor have in a DC circuit?
- What is self inductance?
- What is Lenz's law? What is Faraday's law? What is back emf? What is the equation for back emf?
- What equation is used to calculate the energy store in an inductor?
- How does the current in an AC circuit with an inductor vary with a change in frequency?
- What is inductive reactance? What equations do you know for inductive reactance?

## B. Past Paper Practice

- The circuit shown in Figure 14 contains an inductor, resistor and switch in series with a d.c. supply.

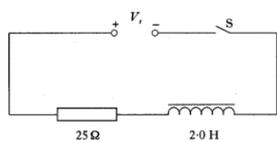


Figure 14

The  $2.0\text{ H}$  inductor has negligible resistance.

Switch S is closed. The current reaches a maximum value of  $400\text{ mA}$  after a time of  $1.5\text{ seconds}$ .

- Explain why the current does not reach its maximum value immediately. 1
- Calculate:
  - The supply voltage  $V_s$ . 3
  - The maximum rate of change of current. 3
  - The maximum energy stored in the inductor. 3
- Switch S is now opened and a spark occurs across the contacts of the switch. Explain why this happens. 1

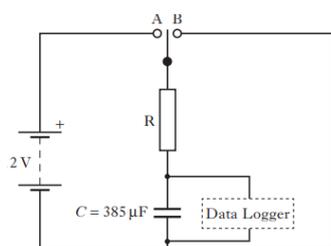


Figure 13A

A student is investigating the charging and discharging of a capacitor. The circuit used is shown in Figure 13A. With the switch in position A, the capacitor charges. To discharge the capacitor, the switch is moved to position B. The data logger monitors the voltage across the capacitor.

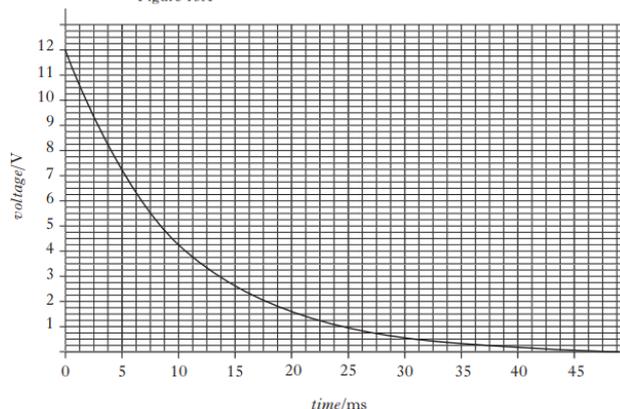


Figure 13B

The graph in Figure 13B shows how the voltage across the capacitor changes during discharge.

- Determine the time constant from the graph. 2
- Calculate the resistance of resistor R. 2

