Practice Question Set For A-Level
Subject : Physics
Paper-1 Topic :7_ Electric Field

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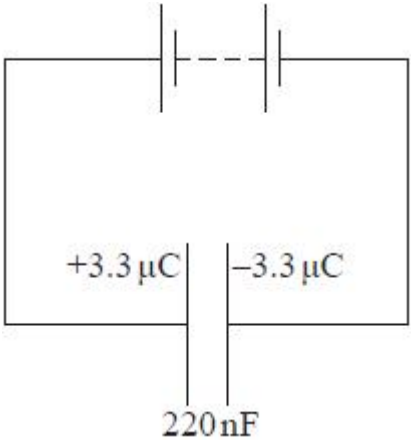
Student:_____
Max. Marks : 24 Marks **Time : 24 Minutes**

Q1.

A capacitor is charged by a battery as shown in the circuit diagram.



(a) Calculate the e.m.f. of the battery and the energy stored in the charged capacitor.

(4)

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E.m.f. = ...

Energy = ...

(b) The capacitor is disconnected from the battery and discharged through a 20 MΩ resistor.
Calculate the time taken for 80% of the charge on the capacitor to discharge through the resistor.

(3)

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Time taken = ...

(c) Use an equation to explain whether the time taken for the capacitor to lose half its energy is greater or less than the time taken to lose half its charge.

(3)

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(d) A student carries out an experiment to record data so that she can plot a graph of potential difference against time as the capacitor discharges.

State **two** advantages of using a datalogger rather than a voltmeter and stopwatch to record this data.

(2)

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(Total for question = 12 marks)

Q2.

A student is investigating how the potential difference across a capacitor varies with time as the capacitor is charging.

He uses a 100 μF capacitor, a 5.0 V d.c. supply, a resistor, a voltmeter and a switch.

(a) (i) Draw a diagram of the circuit he should use.

(2)

(ii) Suggest why a voltage sensor connected to a data logger might be a suitable instrument for measuring the potential difference across the capacitor in this investigation.

(1)

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(b) Calculate the maximum charge stored on the capacitor.

(2)

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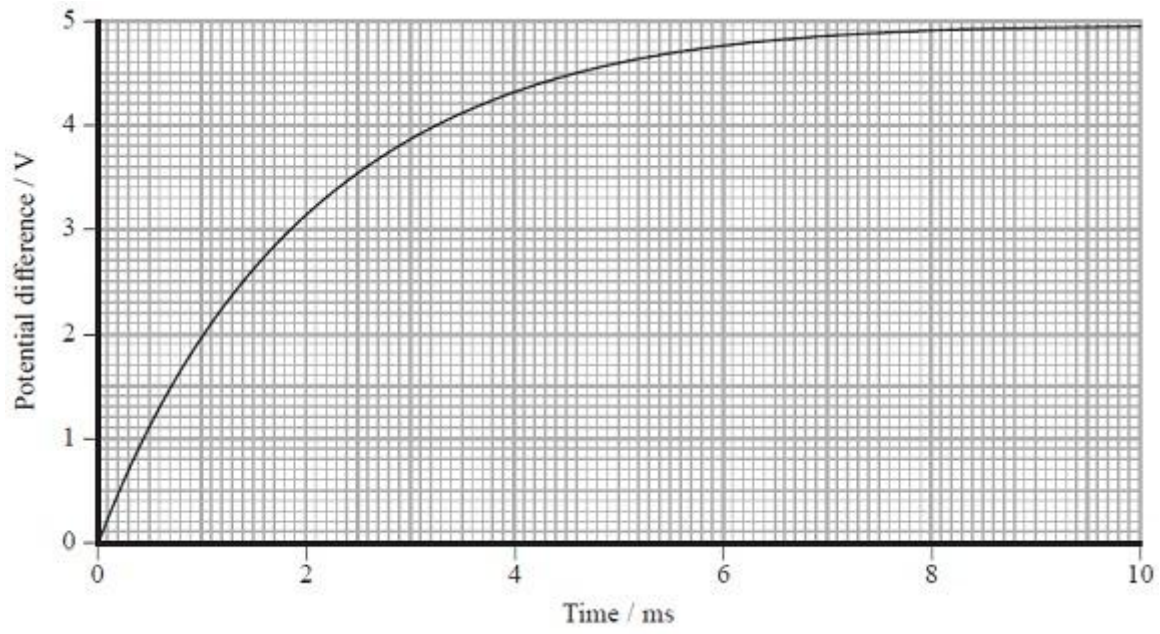
Charge = ...

(c) The graph shows how the potential difference across the capacitor varies with time as the capacitor is charging.



(i) Estimate the average charging current over the first 10 ms.

(2)

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Average charging current = ...

(ii) Use the graph to estimate the initial rate of increase of potential difference across the capacitor and hence find the initial charging current.

(3)

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Initial charging current = ...

(iii) Use the value of the initial charging current to find the resistance of the resistor.

(2)

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Resistance = ...

(Total for Question = 12 marks)