

## **A level Physics B**

**H557/01** Fundamentals of physics

### **Question Set 35**

1 (a)

Fig. 1.1 shows the charging of a 50 mF capacitor by a 10 V supply.

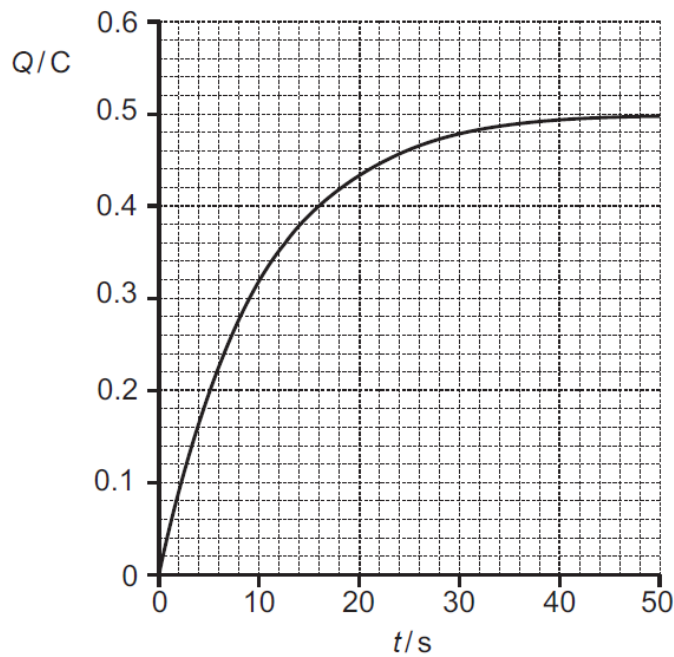


Fig. 1.1

- (i) Use the graph to find the initial current when the capacitor starts to charge. Make your method clear.

initial current = .....A

[2]

- (ii) Calculate the size of the electrical resistance in the charging circuit.

resistance = ..... $\Omega$

[2]

(b)

Explain why the charging current decreases as the capacitor charges.

[1]

- (c) A student makes an iterative model for the charging of the capacitor in (a), using time intervals  $\Delta t = 2.0$  s.

The start conditions and the situation at times  $t = 2.0$  s and 4.0 s have been correctly completed in the table below.

Time lapsed /s $t$	Charge $Q$ on capacitor /C $Q = (Q + \Delta Q)$	P.d. across capacitor /V $V_C = \frac{Q}{C}$	Current flowing /A $I = \frac{V_R}{R} = \frac{(10 - V_C)}{200}$	Charge $\Delta Q$ arriving in time interval $\Delta t = 2$ s /C $\Delta Q \approx I \Delta t$
0	0	0	$10/200 = 0.050$	$0.05 \times 2 = 0.1$
2.0	0.10	$0.1/0.05 = 2.0$	$8/200 = 0.040$	$0.04 \times 2 = 0.08$
4.0	0.18	$0.18/0.05 = 3.6$	$6.4/200 = 0.032$	$0.032 \times 2 = 0.064$
6.0	.....	.....	.....	.....

- (i) Complete the numerical values at time  $t = 6.0$  s in the cells in the table. [2]
- (ii) Compare the model values for the charge  $Q$  on the capacitor at time  $t = 4.0$  s with the experimental values from **Fig. 1.1**.

Explain any differences and state how the model could be improved to be closer to the experimental values.

[2]

**Total Marks for Question Set: 9**

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