

Name of the Student: _____

Max. Marks : 25 Marks

Time : 25 Minutes

Mark Schemes

Q1.(a) (i) charge stored per unit volt or equation with terms defined **(1)**(ii) 0.108 C or 0.11 C c.a.o. **(1)**

2

(b) (i) 1.7 s **(1)**(ii) correct curvature **(1)**intercept on V axis, asymptotic to t axis **(1)**initial voltage, time constant and V after RC seconds shown **(1)**

4

(c) initially no pd across C so rate of charging is high **(1)**Pd across C increases as the capacitor charges **(1)**rate of charging reduces **(1)**

3

[9]**Q2.**(a) $E \propto V^2$ (or $E = \frac{1}{2}CV^2$) **(1)**pd after 25 s = 6 V **(1)**

2

(b) (i) use of $Q = Q_0 e^{-t/RC}$ or $V = V_0 e^{-t/RC}$ **(1)**(e.g. $6 = 12e^{-25/RC}$) gives $e^{\frac{25}{RC}} = \frac{12}{6}$ and $\frac{25}{RC} = \ln 2$ **(1)** $(RC = 36(.1) \text{ s})$

[alternatives for (i):

 $V = 12 e^{-25/36}$ gives $V = 6.0 \text{ V}$ **(1)** (5.99 V)or time for pd to halve is $0.69RC$

$$RC = \frac{25}{\dots} (1) = 36(.2) \text{ s}$$

$$(ii) \quad R = \frac{36.1}{680 \times 10^{-6}} (1) = 5.3(0) \times 10^4 \Omega (1)$$

4

[6]

Q3.

(a) (i) straight line through origin (1)

(ii) $\frac{1}{\text{capacitance}}$ (1)

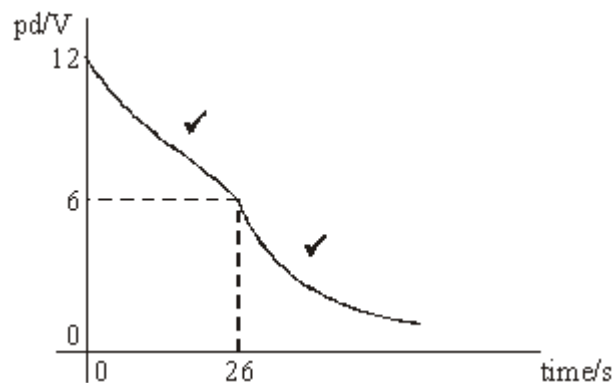
(iii) energy (stored by capacitor) (1) (or work done (in charging capacitor))

3

(b) (i) $RC = 5.6 \times 10^3 \times 6.8 \times 10^{-3} (1) (= 38.1 \text{ s})$
 $V (= V_0 e^{-t/RC}) = 12 e^{-26/38.1} (1)$
 $= 6.1 \text{ V} (1) (6.06 \text{ V})$
 [or equivalent using $Q = Q_0 e^{-t/RC}$ and $Q = CV$]

(ii) $(RC)' = 2.8 \times 10^3 \times 6.8 \times 10^{-3} (1) (= 19.0 \text{ s})$
 $V (= 6.06 e^{-14/19}) = 2.9(0) \text{ V} (1)$
 (use of $V' = 6.1 \text{ V}$ gives $V = 2.9(2) \text{ V}$)

(iii)



7

[10]