

Name of the Student: _____

Max. Marks : 18 Marks

Time : 18 Minutes

Mark Schemes

Q1.

(a) $C = \epsilon_0 \epsilon_r A/d$

C1

15.6 nF or 16 nF

A1

2

(b) (i) 2.4×10^9 (V)

B1

1

(ii) $\frac{1}{2} CV^2$ (or $\frac{1}{2} QV$ if attempt to calculate Q made)

C1

$4.3-5.0 \times 10^{10}$ J

A1

2

(iii) 36–40 C

B1

1

(c) recognition that 1% of charge or voltage remains

C1

any appropriate form of decay equation (either exponential or logarithmic)

C1

$3.48 \times 10^6 \Omega$ **cao** (but do not allow if physics error)

A1

3

[9]**Q2.**

- (a) 1 coulomb of charge is stored for a p.d. of 1 V between the plates
(or equivalent statement) Condone 1 coulomb per volt

B1

1

- (b) (i) Correct substitution in $C = \frac{\epsilon_0 \epsilon_r A}{d}$ (ignore powers of 10)

C1

Plate area = $4.65 \times 10^{-3} \text{ m}^2$ or $C = \frac{\epsilon_0 \epsilon_r \pi r^2}{d}$ with correct data

A1

Radius = (their area / 3.14)^{1/2}; 0.038(4 or 5) m if correct

B1

3

- (ii) $E = \frac{1}{2} CV^2$ or correct numerical substitution or
 $E = \frac{1}{2} QV$ & $Q = VC$

C1

$4.1(4) \times 10^{-10} \text{ J}$

A1

2

- (c) Time constant = RC or Time to halve = $0.69 RC$
or $V = V_0 e^{-t/RC}$

C1

Time to fall to 1/e (0.19 ms) or time to halve (0.13 ms)
or $V_0 = 6 \text{ V}$ and correct coordinates of point on line
(0.6 ms max)

C1

8.1 - 8.6 MΩ

A1

3

[9]