Question Number	Answer	Mark
1(a)	Charges **(1)** Movement of electrons from one plate to the other OR one plate becomes + the other – OR until pd across C equals V_{supply} **(1)**	**2**
1(b)(i)	Use of $Q = It$ (both 0.74 and 0.1/0.2) **(1)** Recognition of milli and Δt =0.1 **(1)** Eg $Q = 0.74 \times 10^{-3} \times 0.1 = 74 \times 10^{-6}$ C	**2**
1(b) (ii)	Use of $V = Q/C$ **(1)** Explains unit conversion **(1)** Eg $V = 278 \times 10^{-6} / 100 \times 10^{-6} = 2.78$ [accept μ/μ]	**2**
1(c)(i)	Recall of *RC* **(1)** Answer = 0.3 (s) **(1)** Eg $T = 3000 \times 0.0001$ **plus either** 1/e or 37% of initial **(1)** =0.23 - 0.27 (s) **(1)** **or** sub in formula $I=I_0e^{-t/RC}$ **(1)** = 0.23 - 0.27 (s) **(1)** **or** Initial Tangent drawn **(1)**	
	Time constant = 0.2-0.3 (s) **(1)**	**4**
1(c)(ii)	Plot Ln *I* **/** Log *I* **(1)** Against *t* **(1)** (dependent on first mark) or Gradients of graph (1) Against I (1) (dependent on first mark) should be straight line **(1)** (dependent on previous 2)	**3**
	Total for question	**13**

Question Number	Answer		Mark
2(a)	The capacitor stores charge **Or** capacitor charges from the supply The idea that the capacitor doesn't fully discharge before being recharged.	**(1)** **(1)**	**2**
2(b)(i)	$(6.4 + 4.4)/2 = 5.4$ V	**(1)**	**1**
2(b)(ii)	Use of $V = IR$ Average $I = 5.4\ \text{V}/(2.2 \times 10^{3}\ \Omega) = 2.5 \times 10^{-3}$ A ecf value form (b)(i)	**(1)** **(1)**	**2**
2(b)(iii)	Time = 17 ms or 17.5 ms	**(1)**	**1**
2(b)(iv)	Use of $Q = It$ Use of $C = Q/V$ Use of $\Delta V = 2.0$ V $C = 21\ \mu\text{F}$ (ecf values of I and t from above) <u>Example of calculation</u> $Q = 2.5 \times 10^{-3}\ \text{A} \times 17 \times 10^{-3}\ \text{s} = 4.25 \times 10^{-5}\ \text{C}$ $C = 4.25 \times 10^{-5}\ \text{C} / 2.0\ \text{V}$ $C = 21\ \mu\text{F}$	**(1)** **(1)** **(1)** **(1)**	**4**
2(c)	Uses a larger capacitance Because a larger time constant is needed **Or** stores more charge **Or** less $\Delta V \rightarrow \Delta Q/C$	**(1)** **(1)**	**2**
	Total for question 17		**12**

Question Number	Answer	Mark
3(a)	Use of $Q = It$ **(1)** Q = 2.8 C **(1)** <u>Example of calculation</u> $Q = 2.0 \times 10^{3}$ A $\times 1.4 \times 10^{-3}$ s Q = 2.8 C	**2**
3(a)(ii)	See $\tau = RC$ **(1)** $\tau = 3.0 \times 10^{-4}$ (s) **(1)** Relates time constant to the time for which current is required **(1)** <u>Example of calculation</u> $\tau = 0.50\Omega \times (600 \times 10^{-6}$ F) $\tau = 3.0 \times 10^{-4}$ s 1.4×10^{-3}s / 3.0×10^{-4} s = 4.7RC	**3**
3(b)(i)	Use of $Q = CV$ **(1)** V = 4700 V (e.c.f from (a)(i)) **(1)** <u>Example of calculation</u> V = 2.8V / (600×10^{-6} F) V = 4670 V	**2**
3(b)(ii)	Use of $W = ½ QV$ **Or** $W = ½ Q^2/C$ **Or** $W = ½ CV^2$ **(1)** Use of $P = W/t$ **(1)** P = 4.7 MW (e.c.f. from (a)(i) and/or (b)(i)) **(1)** <u>Example of calculation</u> P = (2.8 C × 2.8 C) / (2 × 600 × 10^{-6} F × 1.4 × 10^{-3} s) P = 4.7 MW	**3**
	Total for question 15	**10**