

Name of the Student: _____

Max. Marks : 20 Marks

Time : 20 Minutes

Mark Schemes

Q1.

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

Q2.

Question Marks	Acceptable Answers	Additional guidance	Mark
i	- Use of $W = \frac{1}{2} CV^2$ (1) $W = 45 \mu\text{J}$ (1)	<u>Example of calculation</u> $W = \frac{1}{2} 40\mu\text{F} \times (1.5 \text{ V})^2$ $W = 45 \mu\text{J}$ Alt: Use $Q = CV$ then $E = QV/2$ for MP1	2
ii	- Use of $V = V_0 e^{-t/RC}$ (1) - Time = 0.14 (s) (1)	<u>Example of calculation</u> $0.5 = e^{-t/5000 \times 40 \times 10^{-6}}$ $\ln 0.5 = -t/0.2$ $t = 0.14\text{s}$	2
iii	- Use of speed = d/t (1) - Speed = 3.6 ms^{-1} (1) Allow ecf from ii	Show that value gives 5.0 ms^{-1} <u>Example of calculation</u> $v = 0.5\text{m}/0.14\text{s}$ $= 3.6 \text{ ms}^{-1}$	2
iv	- use of $s = \frac{at^2}{2}$ (1) $s = 9 \text{ cm}$ (1) + comment that foil is not broken at its centre (comment consistent with calculation) Allow ecf from ii	Show that value gives 0.049 m <u>Example of calculation</u> $s = \frac{9.81 \text{ ms}^{-2} \times 0.14^2 \text{ s}}{2} = 0.094 \text{ m}$	2