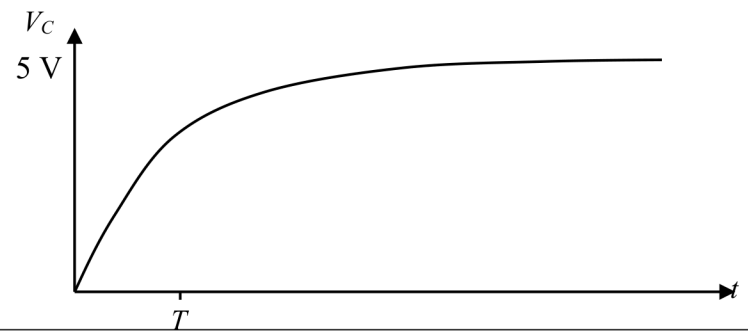
Question Number	Answer	Mark
15ai	exponential growth curve starting at origin and levelling at 5 V (accept V_0) (1) levelling off after at approx. 4 to 5 time constants **Or** curve through approx 2/3 of maximum at T (accept labelled as 3.2 V or 63%) (1) <u>Example of graph</u>  	**2**
15aii	**Either** (1) p.d. would decrease exponentially from 5 V Or p.d. would decrease exponentially to 0 V Because the sum of the p.ds across the capacitor and resistor must always add up to the supply p.d. (1) **Or** as capacitor charges then p.d. across resistor must decrease from 5 V. (1) so current in resistor decreases so rate of change of p.d. decreases (1)	**2**
15aiii	$5 = V_R + V_C$ (1) Use of $V_R = V_0 e^{-t/RC}$ and $V_0 = 5$ to give required equation (1)	**2**
15b	Use of $V_C = 5 - 5e^{-t/RC}$ (1) Takes ln of both sides of equation (1) $C = 48$ μF so select 47 μF (1) <u>Example of calculation</u> $3.3 = 5 - 5e^{-3.5/68000\times C}$ $\ln\frac{1.7}{5} = -\frac{3.5}{68000\times C}$ $1.08\ C = 5.15\times10^{-5}$ $C = 4.77\times10^{-5}$ F So 47 μF	**3**
	Total for question 15	**9**