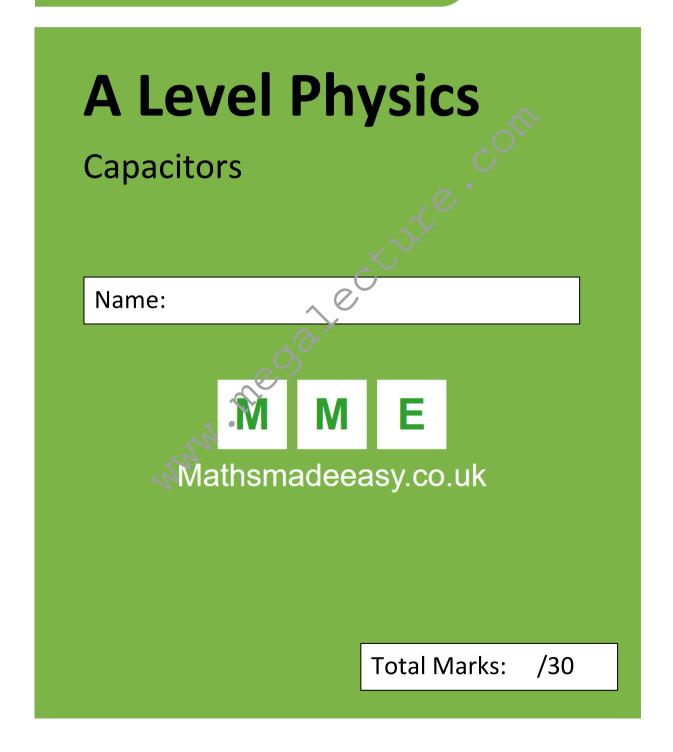


OCR A Level



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1. George wishes to explore the rules for multiple capacitors. To do this, he constructs a circuit using three: C_1 is connected in series with C_2 ; these are both connected in parallel with C_3 . All are connected to a 6 V power supply. $C_1 = 10 \ \mu F$, $C_2 = 20 \ \mu F$ and $C_3 = 50 \ \mu F$.

Total for Question 1: 13

(a) Explain in terms of the flow of electrons how a potential difference is built up across a capacitor.

(b) Outline a different experiment George could perform to confirm the rule for capacitance in series circuits. Include a circuit diagram.

[3]

[3]



(c) Calculate the following for George's circuit.

i. The total capacitance of the circuit.

[3]

ii. The reading on a voltmeter placed across capacitor 1

[3]

iii. The reading on a volt meter placed across capacitor 2. [1]

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2.	Total for Questic		on 2: 6	
	(a)	What is represented by the area underneath a graph of the potential difference across a resistor against the charge stored by it?	[1]	
	(b)	From the equation $W = \frac{1}{2}QV$, derive two other equations for the energy stored in capacitor. One should not include the term V and one should not include the term Q .	[3]	
	(c)	State the effect of each of the following on the energy stored by a capacitor.	[2]	
		i. Doubling the potential difference across it.		
		ii. Halving the capacitance.		



3. Ella charges a 50 μ F capacitor using a 6 V power supply. She then discharges it through a resistor of resistance R (connected in parallel).

Total for Question 3: 11

(a) Outline an experiment that Ella could perform to demonstrate the discharge characteristics of a capacitor when it is discharging through a resistor. Include a circuit diagram.

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(b) After 10 s, the charge has reduced by 99 μ C from its initial value of 300 μ C. Calculate R.

[2]

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(c) Calculate the current in the circuit 2τ after the switch has been turned on.

[2]

(d) Once it has completely discharged, Ella recharges the capacitor using the same 6 V power supply. Calculate the potential difference across the capacitor after 5 s.

[2]



(e) Sketch, on a single set of axes, the variation of V_c , V_R and V_0 with time during charging. V_C , V_R and V_0 are the potential differences across the capacitor, the resistor and the power supply respectively.

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[2]