

YEAR 2 | MODULE 6 | PACK 02

Charging, discharging and circuit models

Official past-paper mark scheme

2017-2023 | OCR A H556 | 6.1.1(c)-(e); 6.1.3(a)-(e)

23 marks | 8 question entries

One practice session

Match each extract using its question number and stable CP identifier. Original OCR answers, examiner guidance, alternatives, diagrams and level descriptors are preserved.

The heading gives the maximum marks for the assigned subparts. Alternative methods and "any n from" lists offer routes to those marks; do not add every printed point together.

Click a source reference to open OCR's full official mark scheme. Keep this file closed while attempting the questions.

Reserved: all 2024 and 2025 papers are excluded. These files contain official examination questions only; no sample, specimen or practice papers.

Question index

CP identifiers are stable across the question packs and mark schemes; Q numbers refer to this pack. All MCQs appear first.

Question / source	Marks	Page
Q01 CP02	1	4
June 2017 H556/02 Q8		
Q02 CP07	1	4
June 2018 H556/02 Q9		
Q03 CP10	1	4
June 2019 H556/02 Q14		
Q04 CP13	1	4
November 2020 H556/02 Q7		
Q05 CP16	1	4
November 2021 H556/02 Q6		
Q06 CP17A	4	5
November 2021 H556/02 Q20(a)		
Q07 CP04B	4	6
June 2017 H556/02 Q21(b)(i)-(ii)		

Question index - continued

CP identifiers are stable across the question packs and mark schemes; Q numbers refer to this pack. All MCQs appear first.

Question / source	Marks	Page
Q08 CP19	10	7
June 2022 H556/03 Q6		

Q01 | CP02

1 mark

June 2017 | H556/02 | Q8

Question	Answer	Marks	Guidance
8	D	1	

Q02 | CP07

1 mark

June 2018 | H556/02 | Q9

Question	Answer	Marks	Guidance
9	D	1	

Q03 | CP10

1 mark

June 2019 | H556/02 | Q14

Question	Answer	Marks	Guidance
14	B	1	

Q04 | CP13

1 mark

November 2020 | H556/02 | Q7

Question	Answer	Marks	Guidance
7	D	1	

Q05 | CP16

1 mark

November 2021 | H556/02 | Q6

Question	Answer	Marks	Guidance
6	C	1	

Q06 | CP17A

4 marks

November 2021 | H556/02 | Q20(a)

Question			Answer	Marks	Guidance
20	(a)		$(CR =) 2000 \times 10^{-6} \times 120 \times 10^3$ $1.00 = 1.48 \times [1 - e^{-t/240}]$ or $0.48 = 1.48e^{-t/240}$ $(t =) -240 \times \ln(0.48/1.48)$ $t = 270 \text{ (s)}$	C1 C1 C1 A1	$CR = 240 \text{ (s)}$ Special case: 94 (s) for use of discharging equation. Max 2 marks

Q07 | CP04B

4 marks

June 2017 | H556/02 | Q21(b)(i)-(ii)

Question			Answer	Marks	Guidance
	(b)	(i)	capacitance of two capacitors in series = 500 (μF) $C = 1000 + 500$ $C = 1500$ (μF)	C1 A1	
		(ii)	$V = 1.5 \times e^{-12/15}$ $V = 0.67$ (V)	C1 A1	Possible ecf from (i) Allow 1 mark for 0.83 V, $V = 1.5[1 - e^{-12/15}]$ used

Q08 | CP19

10 marks

June 2022 | H556/03 | Q6

Question			Answer	Marks	Guidance
6	(a)		time taken for current (or charge or voltage) to fall to 1/e <u>of its initial value</u>	B1	Not capacitance Not to fall <u>by</u> (a factor of) 1/e Allow to decrease <u>to</u> 37% of its initial value Allow to decrease <u>by</u> 63% Ignore time constant = CR
	(b)	(i)	$f (= 1/T) = 1 / (40 \times 10^{-3})$ $f = 25 \text{ (Hz)}$	B1 B1	Allow $f = 1/T$ and $T = 40 \times 10^{-3} \text{ (s)}$
		(ii)	EITHER Calculation of Q_0 / e time constant (read from graph) = 14 (ms) OR Use of $Q = Q_0 e^{-t/CR}$ time constant = 14 (ms)	C1 A1 (C1) (A1)	Allow any initial value of charge e.g. $8.0 / e = 2.9 \text{ (}\mu\text{C)}$ or $37\% \times 8.0 = 3.0 \text{ (}\mu\text{C)}$ Allow $14 \pm 1 \text{ (ms)}$ e.g. $2.0 = 8.0 e^{-0.02/CR}$ gives $CR = 0.02 / \ln 4$ Using the decay equation may incur two POT errors
		(iii)	tangent drawn to graph <u>at steepest part of curve</u> maximum current in range 5.0×10^{-4} to $7.0 \times 10^{-4} \text{ (A)}$	M1 A1	Judge by eye, no daylight between curve and tangent Allow a negative answer Allow answer to 1sf

Q08 | CP19 - continued

10 marks

June 2022 | H556/03 | Q6

Question			Answer	Marks	Guidance
6	(b)	(iv)	vertical axis labelled as current with the correct unit and at least one positive and one negative scale marking and scale should allow for their maximum current to be plotted exponential decay of current in each section sign of current alternates at 20, 40, 60 and 80 ms	B1 M1 A1	For example I / mA , $I (\text{mA})$, $I / 10^{-4} \text{ A}$, current in mA etc All scale markings shown must be correct Allow any curve with a decreasing gradient in each section Ignore value of minimum current but not zero Ignore sign of current for this marking point All curves should start at the correct maximum current value. However, If B1 mark has not been scored, allow any value of maximum current as long as it remains consistent across all four sections