

YEAR 2 | MODULE 6 | PACK 03

Discharge graphs and experiments

Official past-paper mark scheme

2017-2023 | OCR A H556 | 6.1.3(a)-(e); practical analysis and uncertainties

22 marks | 4 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. This pack has no selected MCQs.

Question / source	Marks	Page
Q01 CP08A	2	3
June 2018 H556/02 Q22(a)		
Q02 CP17B	4	4
November 2021 H556/02 Q20(b)		
Q03 CP18B1	5	5
June 2022 H556/02 Q22(b)(i), (b)(ii)1		
Q04 CP05	11	6
June 2017 H556/03 Q3		

Q01 | CP08A

2 marks

June 2018 | H556/02 | Q22(a)

Question			Answer	Marks	Guidance
22	(a)		$(V = V_0 e^{-t/CR}) \quad \ln(V/V_0) = -t/CR \quad \text{or} \quad \ln V = \ln V_0 - t/CR$	B1	Note the minus sign is necessary
			$\ln V = \ln V_0 - t/CR \quad \text{and} \quad y = mx + c \quad / \quad \text{gradient} = -1/CR$	B1	

Q02 | CP17B

4 marks

November 2021 | H556/02 | Q20(b)

Question			Answer	Marks	Guidance
	(b)		Line of best fit drawn through the data points Gradient = 38 ($Ck\ln 2 = \text{gradient}$) $1.2 \times 10^{-3} \times k \times \ln 2 = 38$ $k = 4.6 \times 10^4 (\Omega \text{ m}^{-1})$	B1 C1 C1 A1	Allow ± 2 . Not calculated through use of a single point. Possible ECF from incorrect gradient Note: gradient of 40 gives 4.8×10^4 and gradient of 36 gives 4.3×10^4

Q03 | CP18B1

5 marks

June 2022 | H556/02 | Q22(b)(i), (b)(ii)1

Question			Answer	Marks	Guidance
	(b)	(i)	Evidence of use of $V = V_0 e^{-t/CR}$ leading to $\ln(1/2) = -T/CR$ or $\ln 2 = T/CR$ $T = C \ln 2 \times R$ compared with $y = mx$ with gradient = $C \ln 2$	M1 A1	Must see exponential decay as starting point (allow Q for V) Allow t for T Allow x for V and x_0 for V_0 Not $T/R = \text{gradient}$
		(ii)1	Best-fit line drawn correctly gradient = $5.4 (\times 10^{-9})$ $C = (\text{gradient} / \ln 2) = 7.8 \times 10^{-9} \text{ (F)}$	B1 B1 B1	Note line must pass through all (vertical part of) error-bars. If more than one line drawn, all lines must pass through all error-bars (1/2 square tolerance). Allow $\pm 0.2 (\times 10^{-9})$ Ignore POT Ecf from incorrect gradient, but penalise POT error here

Q04 | CP05

11 marks

June 2017 | H556/03 | Q3

Question			Answer	Marks	Guidance
3	(a)		Take $\ln$ to give $\ln V = -(t/C).1/R + \ln V_0$ gradient (m) = (-) t/C where $t = 15$	M1 A1	allow $\ln(V/V_0) = -(t/C).1/R$
	(b)	(i)	1.10 ± 0.07	B1	value plus uncertainty required for the mark
		(ii)	two points plotted correctly to within $\frac{1}{2}$ small square on x-axis; line of best fit	B1 B1	ignore accuracy of length of error bar; ecf bi value or both worst acceptable lines drawn
		(iii)	gradient ($= 15/C$) = 6.6×10^4 ; $C = 15 / 6.6 \times 10^4 = 2.3 \times 10^{-4}$ (F) worst acceptable straight line drawn $(C) \pm 0.3 \times 10^{-4}$ F	C1 A1 B1 B1	accept 6.4 to 6.8 ignore power of 10 accept $2.3 \pm 0.1 \times 10^{-4}$ allow ecf for the point calculated incorrectly in b(ii) ; steepest or shallowest possible line that passes through <u>all</u> the error bars; should pass from top of top error bar to bottom of bottom error bar or bottom of top error bar to top of bottom error bar allow e.g. $(C) \pm 0.2 \times 10^{-4}$; allow value of C to 4 SF but N.B. the uncertainty and the value of C must be to the same number of decimal places allow $230 \pm 30 \mu\text{F}$ etc allow equivalent unit including $\text{s } \Omega^{-1}$, $\text{C } \text{V}^{-1}$, $\text{A s } \text{V}^{-1}$
	(c)		$\ln(0.1) = -15/RC$ or $R = -15/C \ln(0.1)$ or $R = 0.65/C$ $R = 0.65/2.3 \times 10^{-4}$ giving $R = 28 \text{ k}\Omega$	C1 A1	$\ln(0.1) = -2.30$ ecf (b)(iii)