

Measuring Rates

Q1. (2018)

Question Number	Answer	Additional guidance	Mark
9(a)(i)	(gas) syringe / graduated tube / burette (instead of measuring cylinder)		(1) AO 3 3b

Q2. (2019)

Question number	Answer	Additional guidance	Mark
8(a)	delivery tube, not in liquid, connected to flask sealed with a bung/cork (1) gas syringe / measuring cylinder or burette inverted over water (1)	do not allow a single line for a delivery tube allow sealed cross sections (e.g. delivery tube going through solid bung) labels and graduations not required mark independently	(2)

Q3. (2020) – 3b

Question number	Answer	Additional guidance	Mark
3(b)	final answer of 0.3 with or without working scores 3 MP1 : conversion of time from minutes into seconds $5 \times 60 = 300$ (seconds) (1) MP2 : rate = volume / time rate = $\frac{90}{300}$ (1) MP3 : evaluation of the <u>fraction</u> = 0.3 ($\text{cm}^3 \text{s}^{-1}$) (1)	allow $90/5$ (1) $90/5 = 18$ (2) $300/90 = 3.33$ (2) $5/90 = 0.0556$ (1)	(3)

Q4. (2020)

A)

Question number	Answer	Additional Guidance	Mark
6(a)(i)	An explanation to include - a solid/ precipitate (1) - of sulfur (1)		(2)

B)

Question number	Answer	Additional Guidance	Mark
6(a)(ii)	A description to include - flask placed {over/in front of} cross (1) - measure time (1) - when cross is obscured (1)	MP2 dependent on MP1 allow measure how long reaction takes for MP2	(3)

C)

Question number	Answer	Mark
6(a)(iii)	B 150 cm^3 is the only correct answer. A is incorrect because this makes 16.7 g dm^{-3} HCl C is incorrect because this makes 25.0 g dm^{-3} HCl D is incorrect because this makes 33.3 g dm^{-3} HCl	(1)

Q5. (2021) – 6b

Question number	Answer	Mark
6(b)	diagram of - delivery tube with bung in flask connected to (1) - gas syringe / gas syringe labelled (1) or - delivery tube with bung in flask leading into water trough (below upturned measuring cylinder) (1) - upturned measuring cylinder containing water / measuring cylinder labelled (1) allow - connected delivery tube from flask to upturned test tube in water trough (1)	(2) A01

Q6. (2022)

A)

Question number	Answer	Additional Guidance	Mark
2(a)(i)	100 cm³ measuring cylinder/ (gas) syringe (1) - which has smaller gradations / higher resolution (1)	allow 'smaller measuring cylinder' ignore gas measurer reject (upturned) burette for MP1 MP2 is dependent on MP1 allow (more) precise / (more) accurate allow smaller measurements/ increments ignore easier to use / no gas will escape	(2) A03 3b

B)

Question number	Answer	Additional guidance	Mark
2(a)(ii)	- volume read at 90s = 29 cm³ (1) - rate = $\frac{\text{volume}}{90}$ (1) = 0.3222.... (cm³ per second) (1)	0.31, 0.32, 0.33 with or without working scores 3 0.3 alone scores 0 all other answers require working to have marks awarded allow any value 28-30 ECF for incorrect volume ECF if fraction inverted ECF if 1.5 used instead of 90 eg $\frac{28}{29/30} = 18.66... / 19.33... / 20$ scores 2 1.5 MP3 must be decimal value correctly rounded – ignore fractions	(3) A03 2

C)

Question number	Answer	Additional guidance	Mark
2(a)(iii)	volumes were {constant / stopped rising} OR graph was {flat/plateaued/ levelled off}	allow reactant(s) used up / limiting factor allow no more hydrogen evolved allow EVIDENCE that reaction stopped: measurements stayed the same/ no more bubbles allow graph has reached zero gradient ignore graph is a straight line ignore it has reached the highest {point / volume} ignore reaction has stopped / is complete reject reaction is becoming slower	(1) A03 2

Q7. (2023)

A)

Question number	Answer	Additional guidance	Mark
2(a)	6 or 7 points plotted correctly (2) or 4 or 5 points plotted correctly (1) best fit curve starting at (0,0) (1)	allow +/- half a square for MP3, curve must be a single smooth curved line going through most or all of THEIR plotted points (ecf allowed), or if the points are not visible, through most or all of the correct values reject curves going above or below 100cm ³ by more than half a square reject straight line / dot to dot straight lines bar charts – max 2 marks for plotting points if time value is clear	(3) AO2-1

B)

Question number	Answer	Additional guidance	Mark
2(b)(i)	13	answer may be given in table	(1) AO2-1

Q8. (2023) – 6b

Question number	Answer	Additional guidance	Mark
6(b)	so {gas / chlorine} moves (from flask) to gas jar	ignore to deliver substances ignore to connect the apparatus / to stop gas escaping	(1) AO1-1

Q9. (2024)

A)

Question number	Answer	Additional Guidance	Mark
2(a)	a diagram that includes - apparatus <u>that would collect and measure gas</u> using a gas syringe, measuring cylinder or burette (1) - label stating {gas syringe / measuring cylinder/ burette} (1)	mark independently ignore seals/ blockages MP2 for label, independent of drawing ignore any other labels	(2) AO1 2

B)

Question number	Answer	Additional guidance	Mark
2(b)(i)	47	allow any value from 46-48	(1) AO3 2