

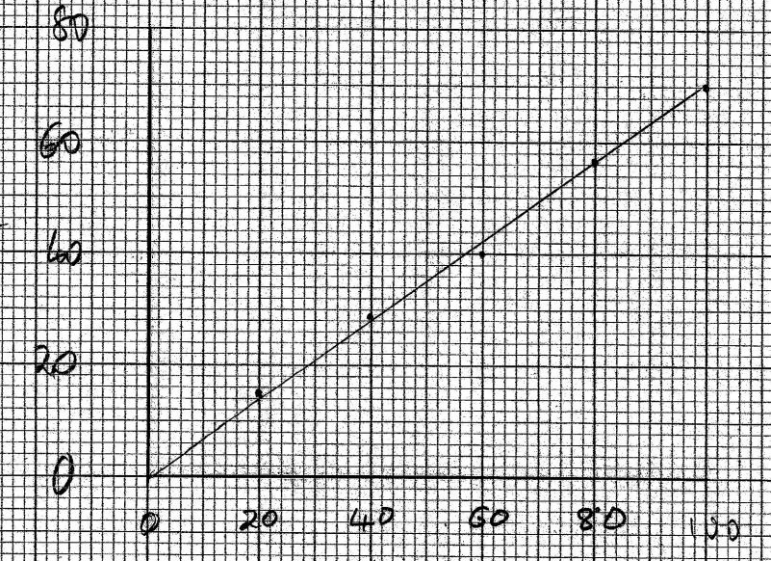
Question number	Answer	Notes	Marks
1 (a)	mass surface area / size / volume	Accept weight Ignore length / width / height / thickness / shape / type Ignore temperature / purity / density	1 1
1 (b)	(2) time / how long (to collect gas)  (3) number of / how many (marble) chips  (4) volume of gas / how much gas collected  (5) per tage / concentration (of acid)	Accept length of reaction/experiment  Ignore amount of marble Accept amount of (marble) <u>chips</u>  Accept carbon dioxide/CO <sub>2</sub> in place of gas Accept amount of gas  Accept strength (of acid) Ignore volume of acid <b>Reject</b> amount (of acid)	1  1  1  1

Question number	Answer	Notes	Marks	
1 (c)	i	all six points plotted to nearest gridline	Deduct 1 mark for each error up to max 2, including extra points, but no penalty for point at 2.4 and 50%	2
		straight line of best fit	Line need not be extrapolated Must be drawn with a ruler CQ on candidate's plotted points	1
	ii	anomalous point circled	at 1.5, 20 or CQ on candidate's line of best fit	1
	iii	timer started late / stopped early	Ignore just wrong time	2
		concentration/% too high/more than 20% marble chips bigger / more marble chips air in measuring cylinder before experiment started (room) temperature higher	Ignore just wrong concentration  Ignore just wrong mass/size  Accept smaller volume of gas collected	
iv		Ignore references to calculation Any two for 1 mark each M1 to M5 CQ on position of anomalous point, so if anomalous point below line of best fit, then: M1 timer started too early/stopped too late M2 concentration/% too low/less than 20% M3 marble chips smaller / fewer marble chips M4 larger volume of gas collected M5 (room) temperature lower		
	vertical line from 50% to drawn graph line	Accept short vertical line crossing graph line at 50% Accept point on graph line at 50%	1	
	2.4 (cm <sup>3</sup> /s)	CQ on drawn graph line but can be awarded without vertical line Do not penalise incorrect units	1	
		<b>Total</b>	<b>14</b>	

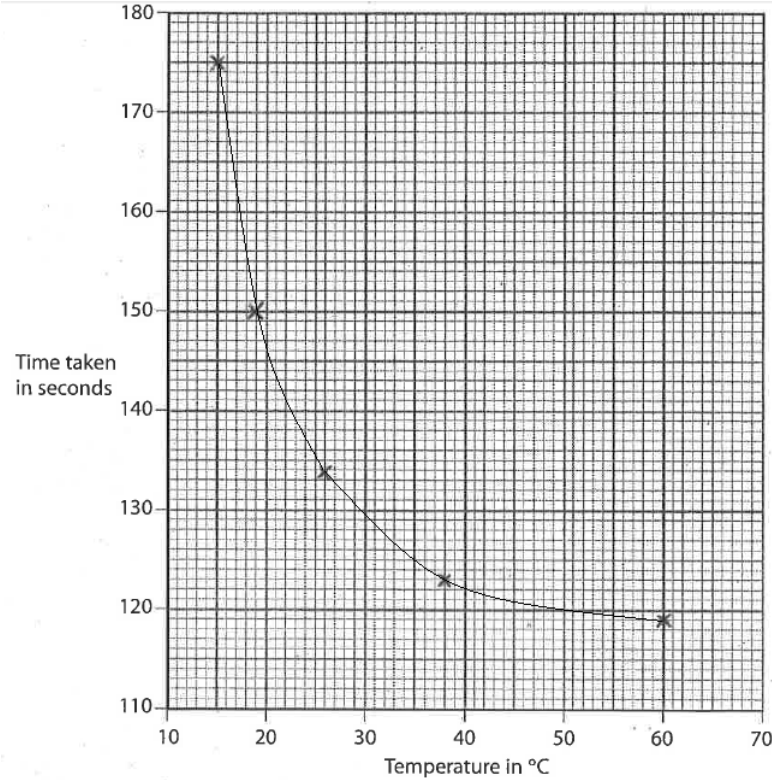
Question number	Answer	Accept	Reject	Marks
2 (a)	<b>M1</b> (reactants) s aq <b>M2</b> (products) aq l g	capital letters		1 1
(b) (i)	to prevent acid escaping/spraying out/spitting out <b>IGNORE</b> to prevent water escaping	solution/liquid/HCl		1
(ii)	C			1
(c) (i)	<b>M1</b> A <b>M2</b> gas produced/collected more quickly / experiment over in shorter time / (gradient of) line steeper <b>M2</b> dep on <b>M1</b>	reaction is faster		1 1 1
(ii)	<b>M1</b> 0.1(0) <b>M2</b> volume of gas is half/40 ÷ 80 = ½ / 80 = 40 x 2 <b>M2</b> dep on <b>M1</b>	Half the products are produced		1
(d) (i)	<b>M1 &amp; M2</b> - all points plotted to nearest gridline deduct 1 mark for each incorrect plot up to a max. of 2			2 1
(ii)	<b>M3</b> suitable straight line of best fit (csq on plotted points) (must be drawn with the aid of a ruler). Line need not be extrapolated. <b>M1</b> as concentration increases rate increases	(show a ) <u>positive</u> correlation  as one doubles the other doubles/directly proportional		1 1

(iii)	<p><b>M2</b> proportional / in proportion</p> <p><b>M1</b> more ions/particles (in a given volume)  <b>IGNORE</b> more reactants</p> <p><b>M2</b> collide (successfully)</p> <p><b>M3</b> more per second/more frequently</p> <p>Must be reference to frequency or number of collisions per unit time  <b>IGNORE</b> greater chance of collision</p>	for 2 marks	<p>molecules/atoms</p> <p>any reference to greater energy</p>	<p>1</p> <p>1</p> <p>1</p>
			<b>Total</b>	<b>16</b>

Question number	Answer	Notes	Marks
3 a	mass / amount	Accept weight	1
	surface area / size / volume	Ignore number of marble chips Ignore length / width / height / thickness / shape / type Ignore temperature / purity / density	1
b	gas/carbon dioxide escapes / OWTTE	Ignore references to solid dissolving Ignore references to acid spray / vapour Do not penalise incorrectly named gas (eg hydrogen)	1
c	prevents loss of acid (spray)/liquid	Ignore references to evaporation / water vapour / spilling of liquid Reject references to stopping gases/marble chips escaping	1
d i	210 (s) some indication of mark on curve OR vertical line from 50% / horizontal line from 210 s	Mark M1 and M2 independently	1
	ii B (the loss of mass was greater than 1.0g)		1
e	1 ÷ 210	Accept any time value in range 200 - 210	1
	evaluation of M1 / 0.00476	Accept answer in range 0.004- 0.005 Accept any number of sig fig	1

Question number	Answer	Notes	Marks
3 f	 <p>all five points plotted to nearest gridline straight line of best fit</p>	<p>Deduct 1 mark for each error up to max 2</p> <p>Line need not be extrapolated to origin If line not extrapolated, it should go to the origin if extrapolated</p> <p>Must be drawn with a ruler CQ on candidate's plotted points</p>	<p>2</p> <p>1</p>

Question number	Answer	Notes	Marks
3 g	<p>more particles (in a given volume)</p> <p>more collisions (between particles) / OWTTE</p> <p>per unit time / OWTTE</p>	<p>Accept ions Reject atoms / molecules Accept quantitative answer such as twice as many particles when concentration doubles</p> <p>more frequent collisions scores M2 and M3 Ignore greater chance/likelihood of collisions Accept reverse argument if clear that decreasing concentration is being considered MAX 1 if any reference to particles moving faster / having more energy</p>	<p>1</p> <p>1</p> <p>1</p>
<b>Total 15 marks</b>			

Question number	Answer	Accept	Reject	Marks
4 (a) (i)	<p><b>M1 &amp; M2</b>– all points correctly plotted to nearest gridline deduct 1 mark for each incorrectly plotted point</p> <p><b>M3</b> <u>smooth</u> curve of best fit drawn</p>  <p>value from candidate's graph to nearest gridline</p> <p>(ii) Penalise incorrect units</p>			2  1
(iii)	<p>as temperature <u>increases</u>, time (taken) <u>decreases</u></p> <p>IGNORE references to rate and inverse proportionality</p>	reverse argument negative correlation		1



Question number	Answer	Accept	Reject	Marks
4 (b)	<p><b>M1</b> (average kinetic) energy of particles/ions increases</p> <p><b>M2</b> more collisions/particles/ions have energy <math>\geq</math> activation energy</p> <p><b>M3</b> more (successful) collisions <u>per second</u> / more <u>frequent</u> (successful) collisions</p> <p><b>IGNORE</b> references to chance of collisions</p> <p>Penalise reference to molecules once only</p>	<p>particles move faster</p> <p>sufficient energy to react</p>	<p>molecules/atoms (but once only)</p>	<p>1</p> <p>1</p> <p>1</p>
(c)	(same) concentration (of each solution)	<p>(same) volume (of each solution)</p> <p>(same) amount of (each) solution</p> <p>rate of mixing</p>		1
			<b>Total</b>	<b>9</b>