Mark Scheme - 1.5 Rate of Chemical Change

1.

Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
(a)	(i)	2	collection of gas (e.g. in a gas syringe or gas jar)　　(1)　　experiment repeated with different particle size of zinc　　(1)	mass method disappearing zinc		
	(ii)	2	same mass (or amount) of zinc / same volume (or amount) of acid / same concentration of acid / same temperature or room temperature – any two for (1) each		repeat readings same apparatus	
	(iii)	1	the fastest is the experiment that gives the volume of gas in the least time	fastest reaction is the one giving off most bubbles in a given time		
(b)	(i)	1	less time / time decrease		faster reaction	
	(ii)	1	volume of gas remains the same			

2.

Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
(a)	(i)	3	all points plotted correctly (2) 4 correct (1) smooth curve through points (1)			line drawn using ruler
	(ii)	1	the higher the temperature, the shorter the time / faster the reaction / higher the rate	'faster the rate'		'faster / quicker the **time**'
	(iii)	1	curve must be **below** original curve and **steeper** – ignore end point			
(b)		2	light intensity decreases (1) continuous readings / graph plotted automatically / more precise end point (1)	light blocked more reliable than eyesight / more repeatable / no judgement required	reference to 'reliability' or 'accuracy' or to 'human error' needs qualification	'**no chance** of human error'

3.

Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
(a)	(i)	1	the higher the temperature the shorter the reaction time	higher temp, faster reaction		

	(ii)	2	surface area (1)
			
			the greater the surface area the shorter the reaction time / faster reaction (1)
			
			or
			
			particle size (1)
			
			the smaller the particle size the shorter the reaction time / faster reaction (1)
			
			     both marks could be credited for one
			     statement e.g. smaller particles react faster
				'form' of calcium carbonate
				
				'powder takes less time than chips'
						molecules become smaller

	(iii)	2	volume of acid (1) concentration of acid (1) mass/weight of calcium carbonate (1) max (2)	'amount of' once only	pH type of acid	
(b)		2	mass decreases (1) gas / carbon dioxide lost from container / released (1)	gets lighter	gas produced	incorrect gas named

4.

Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
(a)			2	coal dust has a much greater surface are than lumps of coal (1) greater chance of collision / more collisions per unit time (1)		faster reaction	
(b)			2	1 day - correct answer only (2) if answer incorrect (1) for any indication of correct working e.g. from 5-15°C halves time from 8 days to 4 days			

5.

Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
(a)			1	value in the range 19–20			
(b)			1	line right of original graph from (0,90) to (35,30) – tolerance of 1 small square			
(c)			2	precipitate formed/insoluble substance formed (1) light cannot travel through/ stops light / blocks light (1)	goes cloudy/ milky		
(d)			1	any of following (apparatus) not light tight / light can get in around tube precipitate formed not dense enough / thick enough / precipitate formed does not block all the light		light all around / light present	

6.

Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
(a)	(i)	1	gas escaped during time taken to place the bung in the flask	gas syringe 'sticks'	human error	
	(ii)	3	all points plotted correctly [±½ square] (2) seven points plotted correctly (1) smooth curve drawn, not passing through (10,8) (1)	curve through (10,8) if (0,0) not plotted		
	(iii)	1	value read correctly from graph [±½ cm³] ecf possible from any curve – except to give 8			8
	(iv)	1	line continues horizontally / volume stops increasing		straight line	
	(v)	2	less time (1) more time (1)			
(b)		2	4 days - correct answer only (2) if answer incorrect (1) for any indication of correct working e.g. from 30-20°C doubles time from 1 day to 2 days			

7.

Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
(a)			3	$M_r(NaHCO_3) = 84$ and $M_r (Na_2CO_3) = 106$ (1) 2 : 1 ratio (1) $126 \rightarrow 79.5g$ (1) award (3) for cao			
(b)			2	70/79.5 (1) 88.05 (1) ecf possible from part (a)			