GCSE Science – Investigative Skills Assignment – Marking Guidelines

Chemistry 2.1 – Controlling Reactions

For use until May 2009

Last date for submission for moderation May 2010

Please mark in red ink, and use one tick for one mark. Each part of each question must show some red ink to indicate that it has been seen.

Subtotals for each part of each question should be written in the right hand margin.

Please add annotations where necessary to explain why marks have or have not been awarded.

Enter the marks for **Section 1** and **Section 2** and the **total mark** on the front cover of the answer booklet.

The teacher must sign and date the front cover of the ISA.

The papers must be kept in a secure place and must **not** be returned to candidates.

The marking guidelines show examples of typical responses that candidates may make. However, teachers should use their professional judgement in deciding whether or not to award marks. If, in the judgement of the teacher, the candidate has provided a response which correctly answers the question, then a mark should be awarded even if this response is not shown in the mark guidance. If necessary, the teacher should annotate the script and/or mark guidance to justify the decision.

In the mark guidance:

- the use of a solidus (/) indicates an alternative answer
- the use of brackets ( ) indicates wording that is not essential in the candidate's answer, but makes the guidance clearer.

SECTION 1

	Answer	Additional Guidance	
1	Statement referring to change in the dependent variable eg to see if rate of reaction changes Independent variable correctly identified and linked to dependent variable eg when I changed concentration of acid	Dependent variable must be identified Just rate of reaction alone is **not** sufficient.	1 mark 1 mark
2(a)	Any **two** from: eg • temperature • surface area of solid • mass of solid eg magnesium / calcium carbonate etc • concentration / volume of solution eg sodium thiosulfate etc		2 marks

	Answer	Additional Guidance	
2(b)	Explanation of how the rate is affected by at least one of the variables chosen eg the higher the temperature the faster the rate (or vice versa)	Accept 'both affect the rate of reaction' Accept named variable affects the rate of reaction Do **not** accept the simple statement to make it a fair test	1 mark
3	Suggestion: named apparatus Suitable explanation: apparatus has a smaller scale division	Named apparatus should have a smaller scale division	1 mark 1 mark
4	Correct variable from candidate's own investigation	Likely to be one of the factors listed in the answer to Question 2(a)	1 mark
5	Error correctly identified. eg measurement errors **or** method errors	Not just '*human error*'. eg difficult to measure volume of gas exactly, surface area difficult to measure in some experiments eg timing difficulties, solution not stirred sufficiently, changes in temperature	1 mark
6	Reliability ticked		1 mark
7	Amplified statement relating the dependant and independent variables eg the rate of reaction **increases** for **1** mark **plus** as the concentration of acid **increases** for **2** marks **or** eg the rate of reaction does not depend on concentration of acid **1** mark **plus** as the results do not show a trend / are random for **2** marks	**NB** the statement **must** relate to the candidate's own results Simple correct statement for **1** mark only eg the rate of reaction depends on the concentration of acid **or** the rate of reaction does not depend on the concentration of acid / does not show a trend	2 marks

	Answer	Additional Guidance	
8	**Table:**		
	Correct headings AND units all correct for all measured variables	Table with incomplete headings or units for the measured variables gains **1** mark eg all headings present = 1 eg all units present = 1	2 marks
	Graph/chart:		
	X axis: suitable scales chosen and labelled with quantity and units	Accept axes reversed	1 mark
	Y axis: suitable scales chosen and labelled with quantity and units		1 mark
	Points or bars plotted correctly to within ± 1mm	Allow **one** plotting error out of every 5 points plotted. Allow error carried forward from incorrect plots	1 mark
	Suitable line drawn on graph or bars correctly labelled on bar chart		1 mark
	If wrong type of graph / chart, maximum **3** marks		
	If the independent variable is: *continuous*	should draw a *best fit line graph*	
	categoric	should draw a *bar chart*	
	discrete	may draw either a *best fit line graph* or a *bar chart* (but allow dot-to-dot joining of points in this case)	
			Max 18 marks

SECTION 2

	Answer	Additional Guidance	
9	0.5		1 mark
10	1.5		1 mark
11	1.5 The anomalous result, 90cm^3, has been included in the calculation of the mean		1 mark 1 mark
12(a)	Point plotted on the graph at position (1 , 38)	Accept $\pm\frac{1}{2}$ a square	1 mark
(b)	Straight line following points	Line **must** exclude anomalous point at 1.5 mol/dm^3 Line **must** go through origin Do **not** accept very thick lines Do **not** accept multiple lines	1 mark
13	As a control	Accept to make sure there was no reaction between water and limestone.	1 mark
14(a)	The volume increases / gets bigger		1 mark
(b)	Divide the volume of gas by the time / 1 minute		1 mark
15(a)	The reaction is too slow (to measure in a reasonable time)	Accept the solution is very dilute **or** it takes too long to measure Accept acid rain is a mixture, therefore may contain different proportions of sulfuric and nitric acid	1 mark
(b)	Correct reason given eg **Yes** – all acids react in the same way / contain the same ion, H^+ / H_3^+O **or** **No** – some acids have different numbers of hydrogen / H^+ ions **or** **No** – sulfuric acid would form insoluble calcium sulfate	No mark for **Yes** or **No** mark is for the reason Accept different types of acids are categoric variables	1 mark
16	Rate of reaction also depends on surface area The surface area of the cubes is exactly known / can be controlled	 Accept the surface area of the irregular lumps is not exactly known / could not be controlled	1 mark 1 mark

	Answer	Additional Guidance	
17	Any **one** point of support: eg • waterproof solution has stopped the reaction • no gas given off after waterproofing Any **one** point against the claim: eg • long term affects not known • only tested for 1 minute • may affect colour etc. of statue • no independent test so company may be biased **Quality of written communication** Candidates should use at least **two** technical terms from: eg • resistant • acid or limestone • reaction / reactivity • treatment • biased	The mark is to be awarded for the **correct** use of the terms The marker should circle these terms. Annotate below candidate answer with *Q✓ for mark given or Q× for mark not given*	1 mark 1 mark 1 mark
			Max 16 marks
			ISA Total 34 Marks