General Certificate of Education (A-level)
June 2013

Chemistry CHM3T/Q13

(Specification 2420)

Unit 3T: Practical and Investigative Skills

Investigative Skills Assignment

Final

Marking Guidelines

Marking Guidelines are prepared by the Principal Moderator and considered, together with the relevant questions, by a panel of subject teachers.

Set and published by the Assessment and Qualifications Alliance.

The Assessment and Qualifications Alliance (AQA) is a company limited by guarantee registered in England and Wales (company number 3644723) and a registered charity (registered charity number 1073334).
Registered address: AQA, Devas Street, Manchester M15 6EX.

Guidance for teachers marking Chemistry ISAs

Final Marking Guidelines must be used to mark students' work.

General principles

In general, you are looking for evidence that the student knows and understands the key idea required by the Marking Guidelines.

It is important to mark what the student has written, not to assume what may have been intended. It is also important to make sure that a valid point is in the correct context. Individual words or phrases where the overall answer does not apply to the question asked should not be credited.

Conventions

The following conventions are used in the Marking Guidelines.

- An oblique stroke (/) separates alternatives within a marking point.
- Underlining of a word or phrase means that the term must be used.
- Brackets are used to indicate contexts for which a marking point is valid. This context may be implied by a student's answer.
- 'Accept' shows answers that have been allowed.
- 'Max' refers to the maximum mark that can be awarded for a particular question.

The Marking Guidelines show the minimum acceptable answer(s) for each marking point. A better, more detailed, or more advanced answer should always be accepted, provided that it covers the same key ideas.

Marking Guidelines cannot give every possible alternative wording - equivalent phrasing of answers should be accepted. It is, however, important to be sure that the minimum requirement of the Marking Guidelines is met and that the point is made unambiguously.

Converse answers are normally acceptable, unless the wording of the question rules this out. For example, 'an increase in pressure favours the forward reaction' or 'a decrease in pressure favours the backward reaction'.

Occasionally, a student will give a chemically correct answer that is not present in the Marking Guidelines. If it is equivalent in standard to the Marking Guideline answers, it should be credited. In this case, write the word 'valid'.

All marking points are awarded independently, unless a link between points is specified in the Marking Guidelines.

The mechanics of marking

Always mark in red ink. Make sure that some red ink appears on every page on which the student has written.

For each mark awarded, put a tick close to the key word or phrase. In all cases, a tick should equal one mark and the total number of ticks should match the mark given for that question. The teacher should write the total mark in the margin.

Put a cross against incorrect points. It is helpful to indicate omissions of key words or incomplete answers with a **Λ** symbol, and to highlight irrelevancies or contradictions etc by underlining. It may also be helpful to write brief comments to explain the reason for awarding or withholding a mark when the answer does not obviously match the Marking Guidelines.

When marking answers with many marking points, the points do not have to appear in the order in which they appear in the Marking Guidelines unless stated otherwise.

Chemical Error
Occasionally, an answer involves incorrect chemistry and the Marking Guidelines records CE = 0, which means a chemical error has occurred and no credit is given for that part.

Disqualifiers
A correct point should be disqualified when the student contradicts it in the same answer. Indicate by 'dq'. If a tick has already been placed against a valid point, ensure that it is clearly deleted. Note that there is no penalty for incorrect points which are not contradictory, nor for surplus or neutral information.

The list rule
When a question asks for a specific number of points, and the student gives more, the general rule is that any wrong answer cancels a correct answer. For example, if a question asks for two points and three answers are given, two correct and one clearly wrong, the mark awarded is one, whatever the order of the answers. This prevents students from gaining full marks from a list of right and wrong answers.

'Neutral' points
ie ones which are not creditworthy but not actually incorrect, should not negate a correct answer. For example, in answer to 'Name **two** physical properties of metals' a student may give:

'Good conductor of electricity, solid, high density'.

In this case, one mark would be awarded for 'good conductor of electricity' and one for 'high density'. 'Solid' is a neutral point and should be ignored.

Two correct points on the same answer line should be credited.

Spelling
Reasonably close phonetic spellings should be credited.

Precision
In questions where students are **not** asked to give an answer to the appropriate precision, answers given with more precision than expected are not penalised. Answers given to a precision less than that indicated in the Marking Guidelines must be penalised.

Rounding
Incorrect rounding of calculations must be penalised, but only once per paper.

Crossed out work
When considering crossed out work, **mark it** as if it were not crossed out **unless** it has been replaced by a later version; this later version then takes priority.

Task Assessment

Marking Guidelines	Mark	Additional Guidance
Student has filled the measuring cylinder to the **correct level** – checked by the teacher	(**M**)1	Bottom of meniscus must be within +/- 1 of the smallest graduation mark. If the student has not filled the measuring cylinder correctly, you should tell them the appropriate adjustment to make.
Results recorded clearly and in full in a table	(**R**)1	If you can read it, it is clear. 'Full' means complete with all concentrations of thiosulfate and times. Do not penalise the absence of labels. Ignore the inclusion of volumes. The table does not have to have gridlines. Allow a clear answer that is outside a table box. Do not penalise absence of units or incorrect units.
All times to the **nearest second**	(**P**)1	If the record is not in seconds, penalise this mark but **annotate the script** with the values into seconds ready for the Written Test.

The **accuracy of the correctly calculated rates** from page 3 of the Written Test. Four points lying within +/- two small squares of the straight line through the origin (5) Three points lying within +/- two small squares of the straight line through the origin (4) Two points lying within +/- two small squares of the straight line through the origin (3) Any three of the points lie on a straight line (+/- two small squares) (2) Difficult to ascertain what the line should be (1) In the table at the bottom of each Candidate Results Sheet, enter your mark for each of the following • measuring cylinder reading (M) • recording (R) • precision (P) • accuracy (A)	(**A**) 5 4 3 2 1	It is **essential** that the teacher **checks** that the student has calculated 1000/*t* correctly to 2 significant figures or 3 significant figures and plotted a graph using the correct data. This means that the teacher must check that the answers to Section A Questions **1 and 2** are correct from the student's results **before** allocating marks for accuracy. If the student has not plotted the points correctly or has not drawn the line correctly, the teacher must correct these mistakes before awarding the accuracy marks. Through the origin means within +/- two small squares of (0,0). A line with five points within +/- two small squares of their straight line but does **not** go through the origin scores 3 marks. If most students score low marks for accuracy, contact your Assessment Adviser.
Total	**8**	

Section A Ignore absence of units unless units are required in the Marking Guidelines. Incorrect units lose the mark.

Question	Marking Guidelines	Mark	Additional Guidance
1	Regardless of precision: • all five values from the Task calculated correctly (2) • at least three values calculated correctly (1) Quotes at least four values to 2 significant figures **OR** 3 significant figures	2 1	
2	Concentration of thiosulfate on the x-axis (**M1**) Sensible scales (**M2**) Plots all points correctly +/– one small square (**M3 and M4**) Plots four out of five points correctly +/- one small square (**M3 only**)	4	If axes unlabelled, use data to decide that concentration of thiosulfate is on the x-axis. Do not award **M2** if the plotted points do not cover at least half of the grid. Do not award this mark if any plotted point is outside the grid.
3	Draws best fit line (**M1**) Through the origin correctly within +/– two small squares (**M2**)	1 1	Lose this mark if the line is doubled or kinked.
4	Reads the value at 0.05 correctly from their graph Reads the value at 0.10 correctly from their graph	1 1	Do not penalise precision.

5	(Rate of reaction is defined as) the <u>change</u> in <u>concentration</u> of a substance / precipitate in unit <u>time</u> / given <u>time</u> (**M1**) The measured change / amount of precipitate / solid / turbidity in these experiments is <u>fixed</u> / <u>constant</u> / <u>unchanged</u> for each experiment (**M2**)	1 1	**M1** may be written mathematically or they may refer to the gradient of a <u>concentration / time</u> graph.
6	If the assertion is **yes / in support** **M1** result expected since doubling the concentration doubles the rate / halves the time **M2** doubles the number of <u>effective</u> / <u>successful</u> / collisions / <u>collisions with E_a</u> in a given <u>time</u> If the assertion is **no / not in support** **M1** the student indicates that their data does not show rate doubles when concentration doubles **M2** errors in timing due to variability of the final turbidity / difficulty in seeing the end-point **OR** errors in cleanliness of the flask affecting the result	1 1	Allow 'doubles the frequency of <u>effective</u> / <u>successful</u> /collisions / <u>collisions with E_a</u>'. Do not accept incompetence or human error for negative assertion.

7	**Two alternatives** EITHER **M1** Identifies shortest time / highest concentration of thiosulfate **M2** (Percentage) error caused by <u>human reaction time</u> has the greatest effect or a description of this idea **OR** **M1** Identifies longest time / lowest concentration of thiosulfate **M2** (Percentage) error in using the <u>measuring cylinder</u> is the greatest or a description of this idea	2	Do not award **M2** unless it is correctly linked to their **M1**. Allow the (percentage) error in recording the <u>time to the nearest second</u> / <u>using</u> <u>the</u> <u>timer</u> is the greatest or a description of this idea. Allow the (percentage) error in the <u>volume</u> / <u>measuring</u> <u>the volume</u> is the greatest or a description of this idea.
8	2(%)	1	Do not penalise precision.
9	The amount of sulfur dioxide formed in each experiment is small **OR** the amount released into the air is small **OR** the solutions are dilute **OR** the reaction has not gone to completion **OR** the solutions were disposed of correctly (**M1**) The sulfur dioxide is soluble / dissolves in water / forms a solution / is aqueous (**M2**)	1 1	Allow SO_2 can be removed/neutralised using safety apparatus / disposal flask / special solution.
Total		**20**	

Section B Ignore absence of units unless units are required in the Marking Guidelines. Incorrect units lose the mark.

Question	Marking Guidelines	Mark	Additional Guidance
10	As concentration increases the amount of heat given out increases / temperature increases (**M1**) More successful collisions or reactions in a given time **OR** more particles have the activation energy (**M2**) (An increase in temperature or more heat given out) increases the rate of a reaction (**M3**)	1 1 1	Any order. Ignore references to an exothermic reaction. Allow could be a second / n^{th} order reaction.
11	The magnesium is coated with an oxide / MgO (**M1**) MgO / the coating / the corrosion product has to be removed before Mg will react **OR** Mg and MgO / the coating / the corrosion product react at different rates **OR** Initially MgO / the coating / the corrosion product reacts not Mg (**M2**)	1 1	Allow magnesium hydroxide. Ignore inert coating.
12	Any **two** from: Slower with hot water or faster with steam The hot water produces $Mg(OH)_2$ / the hydroxide **OR** steam produces MgO / the oxide (Slow) bubbling with hot water **OR** bright white light / flame / white solid with steam	2 max	Any order.

13	Magnesium sulfate is soluble <u>and</u> calcium sulfate is insoluble / slightly soluble / magnesium sulfate is more soluble / calcium sulfate is less soluble / correct trend in solubility (**M1**) <u>Calcium sulfate</u> coats the surface of the calcium (**M2**) Coating prevents further contact with / reaction by the acid (**M3**)	3	Any order. **M1** requires a comparison of the two solubilities. 'Calcium sulfate forms a protective coating' scores **M2** only.
Total		**10**	