



General Certificate of Education

Chemistry

AS Investigative Skills Assignment

CHM3T/P11/MG

Final

Marking Guidelines

2011 examination – June series

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

It must be stressed that Marking Guidelines are a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future Marking Guidelines on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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Guidance for teachers marking Chemistry ISAs

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

General principles

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

It is important to mark what the candidate 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 candidate'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 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 candidate 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 candidate has written.

For each mark awarded, put a tick close to the 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 the Marking Guidelines.

Disqualifiers A correct point should be disqualified when the candidate 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 candidate 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 candidates 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 candidate 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.

Task Assessment

Q	Marking Guidelines	Mark	Additional Guidance
	Candidate reads the burette correctly	(B) 1	If the candidate does not read the burette correctly, tell the candidate the correct reading.
	Results recorded clearly and in full in a sensible table	(R) 1	If you can read it, it is clear. 'Full' means the table must have 'initial reading', 'final reading' and 'titre values' for at least two sets of results. Labels such as 'initial reading', 'final reading' etc are not essential. The table does not have to have gridlines. Allow a clear answer outside a table box. Lose this mark if initial reading is recorded as 50.0 cm ³ Lose this mark if there is an arithmetic error in calculating a titre. Do not penalise missing units but lose this mark if units are incorrect.
	All titre volumes to 0.05 cm ³	(P) 1	Allow zero entries as 0 or 0.0 If a set of readings are labelled 'rough' ignore their precision, unless used to calculate the average.
	Concordant if two titres are within 0.10 cm ³ of each other	(C) 1	Award the mark for concordancy if the table contains at least two concordant results, even if the candidate has not recognised these as concordant titres. Do not award this mark if two concordant results are only achieved by incorrect arithmetic. Can score concordancy mark if titre volumes are only recorded to 1 d.p. but will lose Precision mark.

Q	Marking Guidelines	Mark	Additional Guidance
	<p>The accuracy of the candidate's average titre, measured against a teacher value for the titration</p> <p>This mark can be awarded independent of precision</p> <p>Average titre is within 1% of teacher value</p> <p>Average titre is within 1.5% of teacher value</p> <p>Average titre is within 2% of teacher value</p> <p>Average titre is within 2.5% of teacher value</p> <p>Enter your mark for burette (B), recording (R), precision (P), concordancy (C) and accuracy (A) in the table at the bottom of each Candidate Results Sheet</p>	<p>(A) 4</p> <p>3</p> <p>2</p> <p>1</p>	<p>If a student has two concordant titres then both concordancy and accuracy marks can be awarded.</p> <p>If a student does not have two concordant titres but does have two titres within 0.20 cm^3 of each other, then the concordancy mark cannot be awarded but the accuracy marks can.</p> <p>Titres which differ from each other by more than 0.20 cm^3 cannot receive concordancy or accuracy marks.</p> <p>Check that the student has calculated the average titre correctly. If not, calculate the correct average and base the student's accuracy mark on the correct average. The student does not have to use all of the concordant titres in obtaining an average.</p> <p>If a student has one set of concordant results, and has correctly identified these results, base the accuracy mark on the student's average titre.</p> <p>A student may have one set of concordant results, but uses a non-concordant titre in calculating the average. Average all of the student's concordant titres, and use this average to determine the mark for accuracy.</p> <p>A student may have two sets of concordant results, which do not overlap. The teacher should choose the set of concordant titres that gives the higher accuracy mark, even if the student chooses the other set. Allow a correct calculation of an average titre for either set of concordant results.</p> <p>Do not penalise a candidate who has done more than five titrations.</p> <p>If most candidates score low marks for accuracy, contact your Assessment Adviser.</p>
	Total	8	

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

Q	Part	Marking Guidelines	Mark	Additional Guidance
1		Correctly calculates an average titre using concordant results only (at least 2 results)	1	Do not penalise precision of average titre. Do not award to candidates given teacher's results.
2		$2.5(0) \times 10^{-3}$	1	
3		Correctly uses 2:1 ratio NaOH: H ₂ SO ₃ ratio	1	Correct use $(M_1V_1)/2 = M_2V_2$ scores three marks. Incorrect use of ratio (chemical error) max 1 mark, precision mark only.
		Correctly calculates concentration of sulfuric acid in diluted solution: $(2.50 \times 10^{-3}/2) \times 1000/Q1$	1	Correct answer with 3 sig. fig. scores 3 marks. Correct answer without 3 sig. fig. scores 2 marks.
		Answer, whether correct or not, given to 3 sig. fig.	1	
4		Q3 × 5	1	Do not penalise precision. Correct answer without working scores this mark.
5		82.1	1	Must have M_r to 1 d.p. to score mark. Do not penalise correct answer in g.
6		Q4 × Q5	1	Do not penalise precision. Correct answer without working scores this mark.
7	a	$(1.0 \times 100/50) = 2\%$ $(0.5 \times 100/250) = 0.2\%$	1 1	Do not penalise precision. Two correct answers without correct working score one mark only.
7	b	Use 50 cm ³ measuring cylinder or Use a burette/ pipette	1	Accept make up a greater volume of solution A. Accept use a larger volume of crater-lake solution only. Accept use more accurate/ more precise/ smaller scale measuring cylinder.
8		Gain or loss of water over a period of time/ SO ₂ may escape over time/ may oxidise to H ₂ SO ₄	1	Do not accept to prevent spillages of sample. Do not accept concentration will change over time without further qualification.
9		Presence of other <u>acids</u>	1	Do not allow references to contamination.
		Total	13	

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

Q	Part	Marking Guidelines	Mark	Additional Guidance
10	a	Volume of crater-lake solution on x-axis Sensible scales All points plotted correctly +/- one square	1 1 1	Do not penalise missing axes labels. If axes unlabelled use data to decide. Lose this mark if axes mis-labelled. Lose this mark if plotted points do not cover at least half the paper or plot goes off the squared paper.
10	b	Draws appropriate line of best fit, omitting point at $20 \text{ cm}^3 / 15 \text{ cm}^3$	1	Lose this mark if the line deviated towards the anomalous result. Lose this mark if the candidate's line is doubled or kinked. Candidate does not have to extrapolate to the origin.
10	c	$16.5 \text{ cm}^3 \pm 0.5 \text{ cm}^3$	1	Accept this answer only. Do not mark consequentially on candidate's graph.
10	d	Value corresponding to 10 cm^3 crater-lake solution/ 6.00 cm^3 Greatest % error from use of burette	1 1	Must have correct identity for explanation mark. Accept results aren't concordant. Accept difficult to be accurate with small volumes (owtte).
11	a	$pV = nRT$	1	Accept any correct rearrangement. Ignore case.
11	b	$V = 81.0 \times 10^{-6}$ or 8.1×10^{-5} $n = (1 \times 10^5 \times 81.0 \times 10^{-6}) / (8.31 \times 298)$ $n = 3.27 \times 10^{-3}$ (mol)	1 1 1	Mark consequentially on candidate's volume. Correct answer without working scores one mark only. Allow consequential mark using incorrect conversion. Incorrect units lose this mark.

Q	Part	Marking Guidelines	Mark	Additional Guidance
11	c	$M_r \text{ CaCO}_3 = 100.1$ (M1) $\text{Moles CaCO}_3 = (3.27 \times 10^{-3} \times 10) = 3.27 \times 10^{-2}$ (M2) $\text{Mass CaCO}_3 = M1 \times M2 (= 3.27 \text{ g})$	1 1 1	Accept 100 (can score this mark in calculation for M2 and M3). Do not penalise lack of units. Allow $Q11(b) \times 10$ Allow $1.25 \times 10^{-3} \times 10$ Correct mass without working scores one mark only. Allow $1.25 \times 10^{-2} \times 10 \times 100.1 = 12.5 \text{ g}$
11	d	$(3.27/95) \times 100$ 3.44 g	1 1	Accept $(Q11(c)/95) \times 100$. Do not penalise precision. Do not penalise lack of units. Using 12.5 g gives 13.2 g Correct answer without working scores 2 marks.
11	e	Abundant / readily available Non-corrosive	1	Accept not caustic or alkaline. Accept insoluble so safe to add in excess (owtte).
		Total	17	