General Certificate of Education

Chemistry

Investigative Skills Assignment

CHM3T/P10/MG

Marking Guidelines

2010 examination – June series

WMP/Jun10/CHM3T/P10/MG

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

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, i.e. 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	Part	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. The table does not have to have gridlines. Allow a clear answer outside a table box. 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. Labels such as 'initial reading', 'final reading' etc are not essential
		Titre volumes to 0.05 cm^3	(**P**) 1	Allow zero entries as 0 or 0.0
		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 titres, even if the candidate has not recognised these as concordant titres.

		The **accuracy** of the candidate's average titre, measured against a teacher value for the titration Average titre is within 1% of teacher value Average titre is within 1.5% of teacher value Average titre is within 2% of teacher value Average titre is within 2.5% of teacher value	 (**A**) 4 3 2 1	If a student has two concordant titres then both concordancy and accuracy marks can be awarded. 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. Titres which differ from each other by more than 0.20 cm^3 cannot receive concordancy or accuracy marks. 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. 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. A student may have one set of concordant results, but uses a non-concordant titre in calculating the average. In this case, average all of the student's concordant titres, and use this average to determine the mark for accuracy. 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.
		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		Calculates the correct average titre using concordant results **only**	1	Do not penalise precision of average titre. Do not award to candidates given teacher's results.
2		Calculates moles of sodium hydroxide correctly Calculates concentration of ethanoic acid in diluted solution correctly	1 1	Correct use of $M_1V_1 = M_2V_2$ scores two marks. Do not penalise precision. A correct answer with no working scores one mark only.
3		Answer to Q2 × 10	1	Do not penalise precision.
4		60.0	1	Must have M_r to 1 d.p. to score mark. Do not penalise correct answer in g.
5		Q3 × Q4	1	Do not penalise precision.
6		Calculates the difference between the answer to Q5 and 55.0 (this difference /55.0) × 100	1 1	Difference must be stated clearly to score the first mark. Correct % with no working scores the second mark.
7		(0.15 / answer to Q1) × 100	1	Must use the answer to Q1 (average titre) to score this mark. Do not penalise precision.
8		Suggests suitable change to method to increase average titre eg an increase in concentration / volume of the sodium hydroxide solution used **or** a decrease in concentration of diluted acid solution	1	Do not accept 'use a more accurate burette' **or** 'repeat' **or** 'do the experiment more carefully'.
9		Substances react with NaOH **or** substances have acid/base properties	1	Do not accept 'substances react' without qualification.
10		Composition of vinegar could vary between batches **or** equivalent wording	1	Accept 'to notice anomalous results'. Do not accept 'to get a more accurate / reliable result' **or** 'to make it a fair test' without qualification. Do not accept 'to reduce random errors'.
		Total	**12**	

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
11	a	0.150	1	Accept 0.15
11	b	0.0750	1	Accept 0.75 Accept consequential answer from Q11(a)
11	c	106.0	1	Must have M_r to 1 d.p. to score mark. Only penalise once in paper (see **Section A** Q4). Do not penalise correct answer in g. Ignore wrong units.
11	d	7.95	1	Accept consequential answer from Q11(b) and Q11(c).
12		Hazard: (acid) corrosive Precaution: eye protection/gloves	1	Both hazard and appropriate precaution needed for 1 mark. Do not accept 'toxic' as hazard. Accept 'irritant vapour' and 'fume cupboard'. Do not accept 'ingest'.
13	a	pV = nRT	1	Do not penalise incorrect use of capitals/lower case letters. Accept correct rearrangement of equation.
13	b	T = 293 K V = (0.150 × 8.31 × 293)/ 1 × 10^5 V = 3.65 × 10^{-3} m^3	1 1 1	 Accept consequential answer from moles calculated in Q11(a) Must have correct units for third mark (3.65 dm^3, 3650 cm^3) If T = 20 and answer is V = 2.49 × 10^{-4} m^3 score 2 marks
14		**2**C_4H_{10} + **5**O_2 → **4**CH_3COOH + **2**H_2O	1	Accept any correct combination of multiples, including fractions.
15		23.0 g ethanol produces 30.0 g ethanoic acid 15.1% (4.54 x 100 / 30)	1 1	 Do not penalise precision. 15.1% scores 2 marks. Accept consequential answer on wrong mass of ethanoic acid for second mark only.

Q	Part	Marking Guidelines	Mark	Additional Guidance
16	a	Percentage of oxygen is 36.4% Correct calculation of ratios (C 4.54, H 9.10, O 2.28) Empirical formula C_2H_4O	1 1 1	% of oxygen stated or shown in calculation. Mark is for correct method, dividing % by A_r Allow consequential answer from wrong percentage of oxygen (max 2 marks).
16	b	88	1	Accept 88.0 Do not penalise correct answer in g.
16	c	Ratio MF/EF of 2 (88/44.0 = 2) Molecular formula is $C_4H_8O_2$	1 1	If use 132/44 = 3, molecular formula $C_6H_{12}O_3$ scores 2 marks. Accept consequential answers from Q16(a) and Q16(b)
		Total	**18**	