



General Certificate of Education

Chemistry

Investigative Skills Assignment

CHM6T/P10/MG

Marking Guidelines

2010 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

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
		Results recorded clearly and in full in a sensible <u>table</u>	(R) 1	If you can read it, it is clear. 'Full' means completes at least 11 boxes. Do not allow a list of results.
		The accuracy of the observations 12 scoring points all 12 points scores 7 marks 11 points scores 6 marks 9 – 10 points scores 5 marks 7 – 8 points scores 4 marks 5 – 6 points scores 3 marks 3 – 4 points scores 2 marks 1 – 2 points scores 1 mark	(A) 7	Mark to the grid on page 6. If the teacher results differ from the published grid, consult your Assessment Adviser for guidance. Penalise missing initial colour for the potassium manganate(VII) solution once only. If answers contradict, eg 'No visible change with effervescence' then scoring point is not awarded. Look for the basic colour; ignore additional shades if the answer is unambiguous. Accept 'no change', 'no reaction', 'stays the same' as well as 'no visible change'. Accept 'bubbles (of gas)', 'fizzes' or 'colourless gas formed' as well as 'effervescence'. Do not accept 'clear' instead of 'colourless'.
		Total	8	

Test	Observation with Compound X	Observation with ethanoic acid	Observation with methanoic acid	Observation with methanol
Acidified potassium manganate(VII) solution	Purple to colourless (solution) or to brown (solution)	No visible change / purple solution	Purple to colourless (solution) or to brown (solution)	Purple to colourless (solution) or to brown (solution)
Methyl orange	Red (solution)	Red (solution)	Red (solution)	No visible change / orange solution
Sodium hydrogen-carbonate	Effervescence	Effervescence	Effervescence	No visible change

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		Methanoic acid Results from X match methanoic acid or words to that effect	1 1	Allow consequential marking from candidate's observations.
2		Add aqueous silver nitrate Yellow precipitate	1 1	Allow a named oxidising agent. Brown or brown-red solution / black ppt / blue colour with starch.
3		Methanol and <u>methanoic acid</u> $\text{CH}_3\text{OH} + \text{HCOOH} \rightarrow \text{HCOOCH}_3 + \text{H}_2\text{O}$	1 1	Allow multiples. Allow arrows or equilibrium sign.
4	a	OH acid (present in acid not in ester)	1	Allow absorption at $2500\text{--}3000\text{ cm}^{-1}$ in acid.
4	b	C=O or (absorption at) $1680\text{--}1750\text{ cm}^{-1}$ (present in acid not in alcohol)	1	Allow correct distinction between $3230\text{--}3550\text{ cm}^{-1}$ for OH alcohol and $2500\text{--}3000\text{ cm}^{-1}$ for OH acid.
4	c	Comparison with known spectrum (Exact) match (with known spectrum)	1 1	
		Total	10	

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
5		pH on the <i>y</i> axis, volume of alkali on the <i>x</i> axis	1	If axes unlabelled use data to decide that pH is on <i>y</i> axis.
		Uses sensible scales	1	Lose this mark if plotted paths do not cover half of the paper. Lose this mark if the graph plot goes off the squared paper.
		Labels the axes	1	Allow mark for axes labelled 'pH' and 'volume'.
		Plots all of the points correctly	1	
		Line through the points is smooth and has the correct profile	1	Ignore 0–5 cm ³ section of the graph. Lose this mark if graph is kinked or not a single line.
6		Line ignores the point at 12 cm ³	1	Lose this mark if point clearly not treated as an anomaly.
	a	24.4 cm ³ ± 0.2	1	If no answer in Q6(a) allow answer written on the graph. Allow this answer only . Do not penalise precision.
	b	12.2 cm ³ ± 0.1	1	If no answer in Q6(b), allow answer written on the graph. Allow answer to Q6(a) divided by 2. Do not penalise precision.
6	c	3.9 ± 0.2	1	If no answer in Q6(c), allow answer written on the graph. Consequential marking from Q6(b) Lose this mark if answer not given to 1 dp.

Q	Part	Marking Guidelines	Mark	Additional Guidance
7		$pK_a = -\log K_a$ or $K_a = 10^x$, where $x = -$ (answer to Q6(c)) 1.26×10^{-4}	1 1	3.7 to 4.1 gives $K_a = 7.9 \times 10^{-5}$ to 2.0×10^{-4} Consequential marking from Q6(c). Correct answer without working scores 1 mark only. Do not penalise precision.
8		Methanoic acid	1	Consequential marking from Q7. $pK_a = 3.7$ gives methanoic acid. $pK_a = 4.1$ gives ethanoic acid. No lucky guesses – candidates must apply answer from Q7. Do not allow answers based on data given in Q10.
9		Error in using pipette is 0.2% and Error in using burette is $0.15 \times 100/$ (answer to Q6(a))	1	Using 24.4 for burette gives 0.6% Do not penalise precision. Allow if errors are given without working. Lose mark if the burette error is not calculated on Q6(a). If the error being calculated is not stated, allow if the calculations are in the same order as in the question (pipette, burette).
10		Difference is $1.6 \times 10^{-4} - 1.26 \times 10^{-4} = 0.34 \times 10^{-4}$ $0.34 \times 100/1.6$ is a 21% error	1	Allow consequential answer from Q7. Do not penalise precision. Correct final answer without working scores 1 mark. Using 1.9×10^{-4} gives 0.3×10^{-4} and 18.8%.
11		Calibrate meter or thermostat the mixture or maintain constant temperature	1	Do not allow 'repeat experiment'.
12		Mixture is a <u>buffer</u>	1	

Q	Part	Marking Guidelines	Mark	Additional Guidance
13	a	$\text{MgO} + 2\text{HCOOH} \rightarrow (\text{HCOO})_2\text{Mg} + \text{H}_2\text{O}$	1	Allow multiples. Allow variations such as $\text{MgC}_2\text{H}_2\text{O}_4$
13	b	Less corrosive or less reaction with magnesium or weak(er) acid	1	Do not allow 'less reactive' only. Do not allow answers based on toxicity or environmental effects.
14	a	Carbon dioxide produced during combustion could be recycled/used in formation of methanoic acid	1	Allow idea that CO_2 produced = CO_2 used in formation.
14	b	Methanoic acid renewable resource	1	Accept converse argument. Do not allow 'carbon neutral'.
		Total	20	