



**General Certificate of Education**

**Chemistry**

**Investigative Skills Assignment**

**CHM6T/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, 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 | 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 | <p>If you can read it, it is clear.</p> <p>'Full' means the table must have 'initial reading', 'final reading' and 'titre' values for at least two sets of results – these labels do not have to appear if the values are clear.</p> <p>The table does not have to have gridlines.</p> <p>Allow a clear answer outside a table box.</p> <p>Lose this mark for an arithmetic error in calculating a titre.</p> <p>Do not penalise missing units but lose the mark if unit(s) are incorrect.</p> |
|   | All titre volumes to 0.05 cm <sup>3</sup>                              | (P) 1 | <p>Allow zero entries as 0 or 0.0</p> <p>If a set of readings are labelled 'rough' ignore their precision unless used to calculate the average.</p>  |
|   | Concordant if two titres are within 0.10 cm <sup>3</sup> of each other | (C) 1 | <p>Award this mark if there are two concordant titres even if the candidate has not recognised this.</p> <p>Do not award this mark if two concordant results are only achieved by incorrect arithmetic.</p> <p>Can score concordancy mark if titre volumes are only recorded to 1 d.p. but will lose Precision mark.</p>   |

| Q | Marking Guidelines  | Mark  | Additional Guidance  |
|---|---|---|--|
|   | <p>The accuracy of the candidate's average concordant titre measured against a teacher value for the titration</p> <p>Average titre is within 2% of the teacher value<br/>           Average titre is within 3% of the teacher value<br/>           Average titre is within 4% of the teacher value<br/>           Average titre is within 5% of the teacher value</p> <p>NB These values are larger than usual due to the nature of the task</p> | <p>(A) 4<br/>           3<br/>           2<br/>           1</p> | <p>If a candidate has two concordant titres then both concordancy and accuracy marks can be awarded.</p> <p>If a candidate does not have two concordant titres but does have two titres within <math>0.20 \text{ cm}^3</math>, then the concordancy mark cannot be awarded but the accuracy marks can.</p> <p>Titres which differ from each other by more than <math>0.20 \text{ cm}^3</math> cannot receive concordancy or accuracy marks.</p> <p>Check that the candidate has calculated the average titre correctly. If not, calculate the correct average and base the candidate's accuracy mark on the correct average. The candidate does not have to use all of the concordant titres in obtaining an average.</p> <p>If a candidate has one set of concordant results, and has correctly identified these results, base the accuracy mark on the candidate's average titre.</p> <p>A candidate may have one set of concordant results, but uses a non-concordant titre in calculating the average. In this case, average all of the candidate's concordant titres, and use this average to determine the mark for accuracy.</p> <p>A candidate 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 candidate chooses the other set. Allow a correct calculation of an average titre for either set of concordant results.</p> |

| Q | Marking Guidelines   | Mark     | Additional Guidance   |
|---|--|----------|---|
|   | <p>If the candidate has been supplied with a Centre-prepared equilibrium mixture <b>as a result of an error made by the candidate</b> then one mark should be deducted from the total for the Task. This should be clearly stated on the Candidate Result Sheet.</p> |          | <p>Examples would include</p> <ul style="list-style-type: none"> <li>• spillage or dropping of the sample before placing in the volumetric flask</li> <li>• making up the volume in the volumetric flask significantly above the mark</li> <li>• realisation that the sample in the volumetric flask had been insufficiently mixed i.e. a heterogeneous mixture.</li> </ul> |
|   | <b>Total</b>   | <b>8</b> |   |

**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 <b>only</b>                              | 1      | Allow any set of concordant results for the average.<br><br>Do not penalise precision here if there is at least one correct decimal place in the titre.<br><br>Do not award to candidates who have been given the teacher's value.<br><br>Allow without working so long as it is clear which results have been used – look at the Candidate Results Sheet as well. |
| 2 |      | Q1 x 0.1/1000  | 1      | Do not penalise precision.   |
| 3 |      | Q2 x 10  | 1      | Do not penalise precision.   |
| 4 | a    | 4.0(0) x 10 <sup>-3</sup>  | 1      | Do not penalise precision.   |
| 4 | b    | CH <sub>3</sub> CH <sub>2</sub> COOH : Q3 – Q4(a)  | 1      | Do not penalise precision.   |
| 5 | a    | 0.0940 – Q4(b)   | 1      | Do not penalise precision.<br>0.0682 mol if given data used.   |
| 5 | b    | CH <sub>3</sub> CH <sub>2</sub> OH : 0.102 – Q5(a)   | 1      | Do not penalise precision.<br>0.0338 mol if given data used.   |
| 5 | c    | CH <sub>3</sub> CH <sub>2</sub> COOCH <sub>2</sub> CH <sub>3</sub> : Q5(a)<br>H <sub>2</sub> O : Q5(a) | 1<br>1 | 0.0682 mol if given data used.<br>0.0682 mol if given data used.   |



| Q | Part | Marking Guidelines  | Mark      | Additional Guidance  |
|---|------|---|-----------|--|
| 6 |      | There is water present at the start <b>from the sulfuric acid / catalyst</b>  | 1         | Source of water must be specified.<br>Allow 'reagents contain water'.  |
| 7 | a    | $K_c = \frac{[\text{CH}_3\text{CH}_2\text{COOCH}_2\text{CH}_3][\text{H}_2\text{O}]}{[\text{CH}_3\text{CH}_2\text{COOH}][\text{CH}_3\text{CH}_2\text{OH}]}$    | 1         | Ignore states unless incorrect.<br>Lose this mark if round brackets are used.<br>Do not penalise minor slips in formulae eg missing —CH <sub>2</sub> — or incorrect subscript.<br>Allow correct names instead of formulae. |
| 7 | b    | $= \frac{(0.0745) \times (0.0813)}{(0.0424) \times (0.0525)} \times (0.0525)$ $= 2.72$ <p>Answer, whether or not correct, given to three significant figs</p> | 1         | Allow answer only without working if correct.<br>Lose this mark if the wrong $K_c$ expression is used.<br>Do not expect conversion from moles to concentration but allow if shown.   |
| 8 |      | Less acid is present (so less NaOH needed)<br>Equilibrium would shift to right (side with more ester / less acid)   | 1         |  |
|   |      | <b>Total</b>  | <b>15</b> |  |

**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  |
|----|------|--|------------------|--|
| 9  | a    | Green  | 1                | Ignore shades of green.  |
| 9  | b    | <p><u>Excess</u> acidified potassium dichromate(VI)</p> <p>Reflux (for some time)</p> <p>In the diagram credit should be given for</p> <ul style="list-style-type: none"> <li>• a vertical condenser</li> <li>• an apparatus which would clearly work</li> </ul> | 1<br>1<br>1<br>1 | <p>Lose M3 and M4 for a distillation apparatus.</p> <p>Do not allow this mark for a flask drawn on its own. Penalise diagrams where the apparatus is sealed.</p> |
| 9  | c    | <p>Distillation</p> <p>Immediately (the reagents are mixed)</p>  | 1<br>1           |  |
| 10 |      | Keep away from naked flames  | 1                | Allow heat with water-bath or heating mantle. If a list is given ignore eye protection, otherwise lose this mark.  |
| 11 | a    | <p>Tollens' or Fehling's reagents</p> <p>Silver mirror / red ppt. formed</p>   | 1<br>1           | <p>Incorrect reagent(s) loses <b>both</b> marks.</p> <p>Accept mis-spellings if meaning is clear.</p> <p>Accept 'blue to red' but not 'red' alone.</p>           |
| 11 | b    | <p>Sodium carbonate (solution) / Group II metal</p> <p>Effervescence / evolves a gas</p>   | 1<br>1           | <p>Allow indicator solutions with appropriate colours.</p> <p>Accept any named carbonate or hydrogen carbonate.</p> <p>Accept 'fizzes'.</p>                      |
| 12 |      | <p>Propanoic acid</p> <p>Contains hydrogen bonding</p> <p>Some comparison with other compounds explaining that the intermolecular forces are stronger in propanoic acid</p>  | 1<br>1<br>1      | <p>If this mark is lost allow one mark if there is reference to stronger intermolecular forces in the named compound.</p> <p>Lose M1 and M3.</p>                 |
|    |      | <b>Total</b>   | <b>15</b>        |  |