ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Chemistry

Investigative Skills Assignment

CHM3T/P09/mark

Marking Guidelines

2009 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.

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. *Dr Michael Cresswell Director General*

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.

- A semicolon (;) separates each marking point
- 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' and 'reject' show answers which should be allowed or not allowed.
- Additional instructions are shown in *italics*
- '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 mark point. A better, more detailed, or more advanced answers 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 key word or phrase. In all cases a tick should equal one mark and the total number of ticks should match the totals in the margins.

Put a cross against incorrect points. It is helpful to indicate omissions of key words or incomplete answers with a **?** symbol, and to highlight irrelevancies, 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 will be numbered. The points do not have to appear in the order in the marking guidelines. The appropriate number must be placed alongside the tick. This helps to clarify where a specific point has been awarded and again makes moderation much easier. It also helps to avoid awarding the same point twice.

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, if in answer to 'Name **two** physical properties of metals' a candidate gives:
'High melting point, good conductor of electricity, good conductor of heat', 1 mark would be awarded.
Two correct points on the same answer line should be credited.

Spelling Reasonably close phonetic spellings should be credited.

TASK ASSESSMENT

The following skills are assessed from the **Candidate Results Sheet**:

(a)	the **correct reading of the burette** candidate reads the burette correctly **Notes:** * *if the candidate does not read burette correctly, tell the candidate the correct reading*	**(B)**	**1**
(b)	the **recording** of results results recorded clearly and in full in a table **Notes:** * *if you can read it, it is clear* **full** *means completes at least* **two** *columns correctly* *table does not have to have gridlines *allow clear answer outside of a table box*	**(R)**	**1**
(c)	the awareness of **precision** titre volumes to 0.05 cm^3 *(allow zero entries as 0 or 0.0)*	**(P)**	**1**
(d)	the **concordancy** concordant if two results are within 0.10 cm^3 of each other *(award the mark for concordancy if the table contains at least* **two** *concordant results, even if candidate has not recognised these as concordant results)*	**(C)**	**1**
(e)	the **accuracy** of the candidate's average titre, measured against a teacher value for the titration. average titre is within 1% of teacher value 4 marks average titre is within 1.5% of teacher value 3 marks average titre is within 2% of teacher value 2 marks average titre is within 2.5% of teacher value 1 mark	**(A)**	**4**
			Total 8

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.

SECTION A

Question 1

correctly calculates an average titre using concordant results **only** (at least 2 results) 1

Notes * *do not penalise precision of average titre*
* *do not award to candidates given teacher's results*

Question 2

calculates moles of acid correctly (2.5×10^{-3}) 1

calculates concentration of $NaHCO_3$ correctly 1

Notes * *allow consequential answer from moles of acid*
* *do not penalise precision of concentration*

Question 3

calculates M_r of $NaHCO_3$ to be 84.0 1

Notes * ***must** have M_r to 1 dp to score mark*

Question 4

calculates concentration of $NaHCO_3$ in g dm^{-3} correctly 1

Notes * ***must** multiply answer to q2 by answer to q3 to score this mark*

Question 5

calculates percentage of $NaHCO_3$ correctly 1

Notes * ***must** multiply answer to q4 by 100 divided by 20 to score mark*

Question 6

calculates burette error correctly 1

Notes * ***must** calculate (0.15 x 100 divided by answer to q1) correctly to score mark*

Question 7

does not react with HCl / does not react with $NaHCO_3$ / no acid-base properties 1

Notes * *do not accept 'does not react/ unreactive' on its own*
* *do not accept 'neutral'*

Total 8

SECTION B

Question 8

percentage of oxygen is 58.33 1
correct calculation of ratios (C 3.125, H 4.17, O 3.645) 1
clearly relates ratios to formula eg simplifies ratios (C 1, H 1.29, O 1.17) or for H then 3.125 × 8/6 = 4.17% etc 1

Notes * *correct percentage of oxygen can be stated or shown clearly in a calculation*
* *to score final mark must **clearly** show how ratios relate to $C_6H_8O_7$*
* *allow full credit to candidate who correctly finds*
percentage of oxygen
calculates M_r
shows percentage of H is 8 divided by M_r

Question 9

carbon dioxide/ CO_2 1

Question 10

(a) suitable reaction vessel eg sealed flask or test-tube with side arm or tube in bung 1
suitable collection method eg gas syringe/ over water in measuring cylinder 1

Notes * *collection vessel must allow measurement of gas*
* *if apparatus would leak lose second mark*
* *ignore heating*
* *can draw tubing as single line*
* *accept 2D or 3D diagrams*
* *do not need labels, and ignore mis-labelling*

(b) (i) mass on *x*-axis 1
Notes * *If axes unlabelled use data to decide that mass is on the x-axis*

sensible scales 1
Notes * *lose this mark if the **plotted points** do not cover at least half of the paper*
* *lose this mark if the graph plot goes off the squared paper*

plots points correctly ± one square 1

(b) (ii) draws appropriate straight line of best fit, omitting point at 1.17g/ 86 cm^3 1
Notes * *lose this mark if the line deviates towards the point at 1.17g/ 86 cm^3*
* *candidates does not have to extrapolate the line to the origin to score this mark*
* *when checking for best fit, candidate's line **must** go through the origin ± one square. Extend candidate's line if necessary*

(b) (iii) 129 ± 1 cm^3 1

Notes * *accept this answer **only***

Question 11

CO_2/ gas formed distends stomach/ produces wind/ increases pressure in stomach 1

Question 12

molecular formula has to be a simple multiple of the empirical formula 1
so approximate M_r value will distinguish between the options or equivalent wording 1

Question 13

gas escapes before bung inserted any 2×1 for 2
syringe sticks
carbon dioxide soluble in water

Notes * *do **not** accept 'operator error' / 'inaccurate equipment' / 'equipment leaks'*

Question 14

volume depends on pressure and temperature 1

Notes * *do **not** accept 'to get a more accurate result' or equivalent wording without qualification*

Question 15

Tablets could vary between samples or equivalent wording 1

Notes * *do **not** accept 'to get a more accurate / reliable result' or 'to make a fair test' without qualification*

Question 16

(a) $NaHCO_3$ **least** soluble 1

(b) exhaust gases passed into mixture of NaCl and NH_3 1

Question 17

$2NaHCO_3 \rightarrow Na_2CO_3 + CO_2 + H_2O$ 1

Notes * *accept multiples*

Question 18

106.0 divided by 217.1 $\times$ 100 = 48.8% 1

Notes * *ignore precision of answer*

Total 22