Cambridge Assessment International Education

Cambridge International AS & A Level

CHEMISTRY **9701/32**

Paper 3 Paper 32 (Advanced Practical Skills 2) **May/June 2020**

MARK SCHEME

Maximum Mark: 40

Published

Students did not sit exam papers in the June 2020 series due to the Covid-19 global pandemic.

This mark scheme is published to support teachers and students and should be read together with the question paper. It shows the requirements of the exam. The answer column of the mark scheme shows the proposed basis on which Examiners would award marks for this exam. Where appropriate, this column also provides the most likely acceptable alternative responses expected from students. Examiners usually review the mark scheme after they have seen student responses and update the mark scheme if appropriate. In the June series, Examiners were unable to consider the acceptability of alternative responses, as there were no student responses to consider.

Mark schemes should usually be read together with the Principal Examiner Report for Teachers. However, because students did not sit exam papers, there is no Principal Examiner Report for Teachers for the June 2020 series.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the June 2020 series for most Cambridge IGCSE™ and Cambridge International A & AS Level components, and some Cambridge O Level components.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5: Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).
GENERIC MARKING PRINCIPLE 6: Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Science-Specific Marking Principles

1	Examiners should consider the context and scientific use of any keywords when awarding marks. Although keywords may be present, marks should not be awarded if the keywords are used incorrectly.
2	The examiner should not choose between contradictory statements given in the same question part, and credit should not be awarded for any correct statement that is contradicted within the same question part. Wrong science that is irrelevant to the question should be ignored.
3	Although spellings do not have to be correct, spellings of syllabus terms must allow for clear and unambiguous separation from other syllabus terms with which they may be confused (e.g. ethane / ethene, glucagon / glycogen, refraction / reflection).
4	The error carried forward (ecf) principle should be applied, where appropriate. If an incorrect answer is subsequently used in a scientifically correct way, the candidate should be awarded these subsequent marking points. Further guidance will be included in the mark scheme where necessary and any exceptions to this general principle will be noted.

5 ‘List rule’ guidance (see examples below)

For questions that require ***n*** responses (e.g. State **two** reasons …):

- The response should be read as continuous prose, even when numbered answer spaces are provided
- Any response marked *ignore* in the mark scheme should not count towards ***n***
- Incorrect responses should not be awarded credit but will still count towards ***n***
- Read the entire response to check for any responses that contradict those that would otherwise be credited. Credit should **not** be awarded for any responses that are contradicted within the rest of the response. Where two responses contradict one another, this should be treated as a single incorrect response
- Non-contradictory responses after the first ***n*** responses may be ignored even if they include incorrect science.

6 Calculation specific guidance

Correct answers to calculations should be given full credit even if there is no working or incorrect working, **unless** the question states ‘show your working’.

For questions in which the number of significant figures required is not stated, credit should be awarded for correct answers when rounded by the examiner to the number of significant figures given in the mark scheme. This may not apply to measured values.

For answers given in standard form, (e.g. $a \times 10^n$) in which the convention of restricting the value of the coefficient (a) to a value between 1 and 10 is not followed, credit may still be awarded if the answer can be converted to the answer given in the mark scheme.

Unless a separate mark is given for a unit, a missing or incorrect unit will normally mean that the final calculation mark is not awarded. Exceptions to this general principle will be noted in the mark scheme.

7 Guidance for chemical equations

Multiples / fractions of coefficients used in chemical equations are acceptable unless stated otherwise in the mark scheme.

State symbols given in an equation should be ignored unless asked for in the question or stated otherwise in the mark scheme.

Question	Answer	Marks
1(a)	**I** The following data must be shown • burette readings ***and*** titre for rough titration • 2 × 2 'box' showing both accurate burette readings	**1**
	II Headings and units correct for accurate titration table and headings match readings. • initial / start (burette) reading / volume + unit (*allow vol but not V*) • final / end (burette) reading / volume + unit (*allow value for reading*) • titre or volume / **FA 4** used / added (*not 'difference' or 'total')* + unit *Units: (cm^3) or / cm^3 or in cm^3 or cm^3 by every entry*	**1**
	III All accurate burette readings to 0.05 cm^3	**1**
	IV The final accurate titre recorded is within 0.10 cm^3 of any other accurate titre.	**1**
1(b)	Candidate must average two (or more) titres that are **all** within 0.20 cm^3. Working must be shown or ticks must be put next to the two (or more) accurate titres selected.	**1**
1(c)(i)	Answers for **(ii)**, **(iii)** to 3–4 sf and answer to **(iv)** is an integer.	**1**
1(c)(ii)	½ (**(b)** × 0.1 / 1000)	**1**
1(c)(iii)	(25 × 0.015) / 1000 = 3.75 × 10^{-4}	**1**
1(c)(iv)	Display of $\frac{\textbf{(ii)}}{\textbf{(iii)}} = \frac{1+y}{2}$	**1**
	Correctly calculates *y* to the nearest odd integer	**1**

Question	Answer	Marks
1(c)(v)	Identifies ion as IO_3^- Allow ecf from **(iv)** as below. $IO_4^- + 7I^- + 8H^+ \rightarrow 4\ I_2 + 4\ H_2O$ $IO_3^- + 5I^- + 6H^+ \rightarrow I_2 + 3\ H_2O$ $IO_2^- + 3I^- + 4H^+ \rightarrow I_2 + 2\ H_2O$ $IO^- + I^- + 2H^+ \rightarrow I_2 + H_2O$	**1**
1(d)(i)	$(0.06/25) \times 100 = 0.24\%$	**1**
1(d)(ii)	Not correct as KI is in excess (so volume does not matter)	**1**

Question	Answer	Marks
2(a)	**I** Table to include initial and final mass of stoppered container with FB 5, initial and final temperature, mass added and temperature change. All with correct units.	**1**
	II All masses recorded to the same precision and all temperatures recorded to .0 or .5 °C.	**1**
	Examiner calculates ΔT / mass for candidate and for supervisor	
	III Award if the difference in the ratio between candidate and Supervisor is within 0.20 °C g^{-1}	**1**
	IV Award if the difference in the ratio between candidate and Supervisor is within 0.40 °C g^{-1}	**1**
2(b)(i)	correctly calculates $4.2 \times$ temp change $\times 20$	**1**
2(b)(ii)	correct expression showing 248.2 moles of thiosulfate = candidate mass / 248.2 answer to 2–4 sf	**1**
	ΔH = + ans **(i)** / moles of thiosulfate answer to min 2 sf penalise	**1**

Question	Answer	Marks
2(b)(iii)	2 arrows linking to $Na_2S_2O_3$ (aq) with correct values indicated for each step	**1**
	ΔH = –7.7 – (ans **(b)(ii)**) default value +39.9	**1**
2(c)	anhydrous is exothermic, therefore the temperature drop would be less / final temp would be higher / temperature change would be less	**1**

Question	Answer	Marks
	FB 3 = KI(aq); **FB 4** = $Na_2S_2O_3$(aq); **FB 6** = NH_4Br(aq); **FB 7** = $FeCl_3$ / H^+(aq); **FB 8** = $FeSO_4$ / H^+(aq)	
3(a)(i)	Selects NaOH and warms. For co-ord: If get ppt with cold reagent is this a CON?	**1**
	Fizzing / bubbling **and** gas given off / NH_3 turns (damp) red litmus blue	**1**
3(a)(ii)	Add $AgNO_3$ gives a cream ppt	**1**
	Add NH_3(aq) ppt is insol / partially soluble **AND** Add **FB 4** ppt is sol	**1**
3(a)(iii)	NH_4Br	**1**
3(b)(i)	Add **FB 3** gives a red-brown / orange-brown / yellow-brown / yellow solution **AND** Add starch the solution goes blue / black.	**1**
3(b)(ii)	Add **FB 4** turns the solution purple **AND** On standing becomes yellow / colourless / allow faint ppt.	**1**
	Add NaOH gives a (dirty/dark) green ppt	**1**
3(b)(iii)	Fe^{2+} is present	**1**
	Fe^{3+} has been reduced (by $S_2O_3^{2-}$) mark on obs in **(ii)**	**1**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td rowspan="3">3(c)(i)</td><td>Add H_2O_2 solution turns yellow</td><td>1</td></tr>
<tr><td>Add NaOH gives red / brown ppt
AND
effervescence</td><td>1</td></tr>
<tr><td>Gas given off relights a glowing splint and gas is oxygen

<table><tr><td>test</td><td>obs</td><td>conc</td></tr><tr><td>H_2O_2</td><td>solution pale yellow*</td><td></td></tr><tr><td>NaOH</td><td>red-brown ppt*
fizzes*
relights glowing splint*</td><td>Fe^{3+} ions formed*
oxygen*</td></tr></table></td><td>1</td></tr>
<tr><td>3(c)(ii)</td><td>$Fe^{3+}(aq) + 3OH^-(aq) \rightarrow Fe(OH)_3(s)$</td><td>1</td></tr>
</table>