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Mark Scheme (Results)

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GCE Chemistry (6CH07) Paper 01
Chemistry Laboratory Skills (WA)

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.

- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.

- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.

- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

- Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. Questions labelled with an **asterix (*)** are ones where the quality of your written communication will be assessed.

Using the Mark Scheme

Examiners should look for qualities to reward rather than faults to penalise. This does NOT mean giving credit for incorrect or inadequate answers, but it does mean allowing candidates to be rewarded for answers showing correct application of principles and knowledge. Examiners should therefore read carefully and consider every response: even if it is not what is expected it may be worthy of credit.

The mark scheme gives examiners:
- an idea of the types of response expected
- how individual marks are to be awarded
- the total mark for each question
- examples of responses that should NOT receive credit.

/ means that the responses are alternatives and either answer should receive full credit.
( ) means that a phrase/word is not essential for the award of the mark, but helps the examiner to get the sense of the expected answer.
Phrases/words in **bold** indicate that the <u>meaning</u> of the phrase or the actual word is **essential** to the answer.
ecf/TE/cq (error carried forward) means that a wrong answer given in an earlier part of a question is used correctly in answer to a later part of the same question.

Candidates must make their meaning clear to the examiner to gain the mark. Make sure that the answer makes sense. Do not give credit for correct words/phrases which are put together in a meaningless manner. Answers must be in the correct context.

Quality of Written Communication
Questions which involve the writing of continuous prose will expect candidates to:
- write legibly, with accurate use of spelling, grammar and punctuation in order to make the meaning clear
- select and use a form and style of writing appropriate to purpose and to complex subject matter
- organise information clearly and coherently, using specialist vocabulary when appropriate.
Full marks will be awarded if the candidate has demonstrated the above abilities.
Questions where QWC is likely to be particularly important are indicated (QWC) in the mark scheme, but this does not preclude others.

Question Number	Acceptable Answers	Reject	Mark
1 (a)	**(i) Cation in X** is potassium / K^+ **(1)**	"K"	**4**
	(ii) Anion in X is bromide / Br^- **(1)**	Br_2 or "bromine"	
	(iii) Gas Z is bromine / Br_2 **(1)**	"bromide" or Br^- or Br	
	(iv) X is KBr **(1)**	Just "potassium bromide"	
	Mark cq on (i) and (ii)	CQ formula from incorrectly charged ions	

Question Number	Acceptable Answers	Reject	Mark
1 (b)	**(i) Gas evolved:** ammon**ia** / NH_3 **(1)**	"ammon<u>ium</u>"	**4**
	Cation in Y: ammon**ium**/ NH_4^+ **(1)** *If formula given, it must be correct*	"ammonia"	
	(ii) Anion in Y: sulfate / SO_4^{2-} **(1)**		
	(iii) Y is $(NH_4)_2SO_4$ **(1)**	Just "ammonium sulfate"	
	Mark cq on (i) and (ii)	CQ formula from incorrectly charged ions	

Question Number	Acceptable Answers	Reject	Mark
2	**Bromine water**		**6**
	From: red / brown / orange / yellow (or combinations of these colours) **(1)**		
	To: colourless/decolourised **(1)**	Just "clear"	
	NOTE: If colours are both correct but are given the wrong way round, award **(1)**		
	Phosphorus(V) chloride		
	Steamy fumes/misty fumes/white fumes/steamy vapour/steamy gas/white dense fumes **(1)**	(White) **smoke/solid Just** 'fumes'	
	Ignore fizzing/gets hot/ etc.		
	(damp blue litmus paper) red **(1)**	yellow	
	Acidified potassium dichromate(VI)		
	From: orange **(1)**	yellow	
	To: green or blue **(1)**		
	(or combinations of blue and green)		
	NOTE: If colours are both correct but are given the wrong way round, award **(1)**		

Question Number	Acceptable Answers		
3 (a) (i)	Points correctly plotted **(1)** [allow one slip] Two best fit straight lines **(1)**		**2**

Question Number	Acceptable Answers	Reject	Mark
3 (a) (ii)	Extrapolation **(1)** **Maximum temperature** Read off candidate's graph Expect value between 29.6 – 30.0(^{o}C) **(1)** *ALLOW* a stated value within ±0.1 (^{o}C) of graph's max temp	If the two straight lines do not meet **above** 29.5 ^{o}C	**2**

Question Number	Acceptable Answers	Reject	Mark
3 (a) (iii)	**Volume of HCl(aq):** Read off candidate's graph Expect value between 25.5 – 26.5 (cm^3) *ALLOW:* a stated volume within ±0.5 cm^3 of graph's volume of HCl(aq) *ALLOW:* whole numbers (e.g. "27" if intersection is at 27.0)		**1**

Question Number	Acceptable Answers	Reject	Mark
3 (a) (iv)	0.05(00)		**1**

Question Number	Acceptable Answers	Reject	Mark
3 (a) (v)	**Mark consequentially on (a)(iii) and (iv):** Working e.g. 0.05(00) ÷ candidate's volume of HCl(aq) in dm^3 **(1)** Answer **(1)** e.g. for a volume of HCl(aq) = 26.0 cm^3 [NOTE: *ALLOW* "26" for 26.0] 0.05(00) ÷ candidate's volume of HCl(aq) in dm^3 $= \dfrac{0.05(00)}{0.026}$ $= 1.92$ (mol dm^{-3}) Correct answer only using suitable volume of HCl(aq) scores both marks *IGNORE* s.f. including 1 s.f. (e.g. "2 (mol dm^{-3})")		**2**

Question Number	Acceptable Answers	Reject	Mark
3 (b) (i)	**Read off candidate's graph:** Expect $\Delta T = (29.8 - 22.2) = 7.6$ (°C) *IGNORE* s.f. *IGNORE* any signs *NOTE:* Initial temp is that from the graph		**1**

Question Number	Acceptable Answers	Reject	Mark

3 (b) (ii)	**Mark consequentially on (a)(iii):**
	
	Working
	
	          (1)
	Answer
	
	          (1)
	
	(e.g.
	[**volume of HCl(aq) + 50(.00)** x 4.2 x ΔT]
	= 76 x 4.2 x 7.6
	= 2426 (J))
	
	Assume 2.426 (or similar) is the answer in **kJ**
	
	NOTE: 2nd mark can be awarded cq on a wrong mass and/or a wrong ΔT
	
	(e.g. use of 50(.00) x 4.2 x 7.6
	= 1596 (J) scores **(1)**)
	
	IGNORE sig figs (except one sig fig)
	
	IGNORE any signs
	
	ALLOW use of 4.18 instead of 4.2
		Incorrect rounding of figures	**2**

Question Number	Acceptable Answers	Reject	Mark

3 (b) (iii)	**Working**
	 Dividing as follows:-
	
	 (—) <u>answer to (b)(ii) in kJ or J</u>
	        answer to (a)(iv)
	
	 (1)
	 Negative sign
	
	 (1)
	 Answer to 2 s.f.
	
	 (1)
	
	 NOTE: **The 2 s.f. mark is CQ on dividing kJ or J by mol**
	
	 e.g.
	    — <u>2.426</u>
	        0.05(00)
	
	 = — 49 (kJ mol^{-1})
	
	 NOTE: **must be to 2 s.f.**
	
	 Correct answer to correct s.f. gets 3 marks even with no working
	
	 Correct answer to 2 s.f. with negative sign in **J mol^{-1}** (e.g. — 49000) scores max **(2)**
			3

Question Number	Acceptable Answers	Reject	Mark
4 (a) (i)	Titres 2 and 3 **(1)** Concordant / agree within ($\pm$)0.2 (cm^3) / in close agreement/ titration 1 is a trial or rangefinder or a rough titration, etc. **(1)**		**2**

Question Number	Acceptable Answers	Reject	Mark
4 (a) (ii)	24.20 / 24.2 (cm^3) **Mark cq** on **any** titres chosen		**1**

Question Number	Acceptable Answers	Reject	Mark
4 (a) (iii)	**Mark CQ on (a)(ii)** $\underline{0.100 \times 24.20}$ 1000 = 0.00242 / 0.0024 / 2.42×10^{-3} / 2.4×10^{-3} (mol)		**1**

Question Number	Acceptable Answers	Reject	Mark
4 (a) (iv)	Answer to (a)(iii) ÷ **2** = 0.00121 / 0.0012 / 1.21×10^{-3} / 1.2×10^{-3} (mol)		**1**

Question Number	Acceptable Answers	Reject	Mark
4 (a) (v)	Answer to (a)(iv) ÷ **3** = 0.000403 / 0.0004(0) / 4.03×10^{-4} / $4(.0) \times 10^{-4}$		**1**

Question Number	Acceptable Answers	Reject	Mark
4 (a) (vi)	EITHER Answer to (a)(v) ÷ 0.025(0) = 0.0161 / 0.016(0) / 1.61×10^{-2} / $1.6(0) \times 10^{-2}$ $(mol\ dm^{-3})$ **(1)** so concentration of KIO_3 in g dm^{-3} is 214 $(g\ mol^{-1})$ x 0.0161 $(mol\ dm^{-3})$ = 3.45 $(g\ dm^{-3})$ OR 214 $(g\ mol^{-1})$ x 0.016(0) $(mol\ dm^{-3})$ = 3.42 $(g\ dm^{-3})$ **(1)** OR Calculate mass KIO_3 using 0.000403 x 214 = 0.086242 (g) **(1)** *IGNORE* units even if incorrect (then) $\underline{0.086242\ (g)}$ 0.025 (dm^3) = 3.45 $(g\ dm^{-3})$ **(1)** *ALLOW* 2 s.f. but reject 1 s.f. *NOTE:* Check all calculations as final answer is dependent on accuracy in interim steps		**2**

Question Number	Acceptable Answers	Reject	Mark
4 (b) (i)	$\underline{0.06}$ x 100% = (±) 0.24 / 0.2% 25.00 *NOTE:* ± not required for the mark		**1**

Question Number	Acceptable Answers	Reject	Mark
4 (b) (ii)	Any **TWO** from:- • use white tile or paper as background to burette readings • have eyes level with meniscus (to avoid parallax error) • measure level at bottom of the meniscus • ensure that the burette is upright *ALLOW* • ensure that there are no air bubbles • ensure that the jet is full • remove the funnel from the top of the burette • use a white tile beneath flask • swirl the (conical) flask • run solution from burette **slowly** (into conical flask) • ensure no solution from the burette is left on the sides/walls of the (conical) flask • add solution from burette drop-wise close to the end-point **(2)**	Do more repeats / take more means Temperature of lab must be kept constant, etc	**2**

Question Number	Acceptable Answers	Reject	Mark
5 (a) (i)	**Diagram 1:** (heating under) reflux **(1)** **Diagram 2:** distillation **(1)** *IGNORE* "simple" before "distillation"	**fractional** distillation /condensation	**2**

Question Number	Acceptable Answers	Reject	Mark
5 (a) (ii)	(Expansion of vapour will) build up pressure / prevent explosion	**Just** "dangerous" OR "to prevent vapour escaping" OR "so that heat is not able to escape"	**1**

Question Number	Acceptable Answers	Reject	Mark
5 (b) (i)	The reaction is vigorous OR the reaction is exothermic OR the reaction is (very) fast or violent *ALLOW* To stop a reactant or product escaping *ALLOW* To prevent too much heat being produced *IGNORE* any reference to accidents	So that all the iodine reacts/so that iodine is not in excess OR "It is very reactive" OR "Increase the time for which the solids are in contact" OR "To compensate for heat loss" OR Iodine/I_2 is toxic	**1**

Question Number	Acceptable Answers	Reject	Mark
5 (b) (ii)	(One or both of) the **liquids** flammable / the mixture is flammable/ the organic compounds are flammable OR ethanol and iodoethane are flammable OR ethanol is flammable OR iodoethane is flammable OR to keep the temperature below 100°C OR to control the temperature throughout the heating OR for uniform heating OR to prevent uneven heating	Any mention that iodine/I_2 is flammable OR **Just** "gentle heating" OR To prevent the reaction going (any) faster	1

Question Number	Acceptable Answers	Reject	Mark
5 (b) (iii)	Any lower temperature: 69 to 71 (^{o}C) Any upper temperature: 73 to 75 (^{o}C) *NOTE:* Award the mark if the correct numbers are written the other way round (e.g. **from** 74 (^{o}C) **to** 70 (^{o}C))		1

Question Number	Acceptable Answers	Reject	Mark
5 (c) (i)	0.1(00) (mol)	0.2(00) (mol)	**1**

Question Number	Acceptable Answers	Reject	Mark
5 (c) (ii)	***1st* mark** M_r (CH$_3$CH$_2$I) = 156 **(1)** 0.2(00) mol of iodoethane **(1)** ***2nd* mark** *CQ* on (c)(i) 0.2(00) x 156 = 31.2 g **(1)** ***3rd* mark** is cq on moles of iodoethane ***NOTE*** If 0.2(00) mol of iodine given in Q5 (c)(i), by CQ marking can score all 3 marks here with: M_r (CH$_3$CH$_2$I) = 156 **(1)** 0.4(00) mol of iodoethane **(1)** 0.4(00) x 156 = 62.4 g **(1)**		**3**

Question Number	Acceptable Answers	Reject	Mark
5 (c) (iii)	$\underline{23.4} \times 100\% = 75\%$ ans to (c)(ii) *IGNORE* s.f. except 1 s.f. **NOTE** If 0.2(00) mol of iodine given in 5 (c)(i), by CQ marking can score the mark here with: $\underline{23.4} \times 100\% = 37.5\%$ 62.4	$\underline{23.4} \times 100\% = 92.1\%$ 25.4	**1**

TOTAL FOR PAPER = 50 MARKS

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