Mark Scheme (Results)

Summer 2012

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 meaning 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	Correct Answer	Reject	Mark
1(a)			**3**

Name of solution	**Letter**
Sodium chloride solution	**C**
Potassium iodide solution	**B**
Dilute hydrochloric acid	**D**
Dilute nitric acid	**A**

All four letters correct = 3
Two/three letters correct = 2
One letter correct = 1

Question Number	Correct Answer	Reject	Mark
1(b)	Hydrochloric acid gives effervescence/fizzing/gas /CO_2 OR sodium chloride gives no effervescence/fizzing/gas /CO_2/no reaction	Incorrect gas Incorrect gas	**1**

Question Number	Correct Answer	Reject	Mark
1(c)	$Ag^+(aq) + I^-(aq) \rightarrow AgI(s)$ species **(1)** ALLOW Ag^+I^- state symbols **(1)** This mark is only available if the equation is correct OR is correctly balanced with only the ion charge(s) incorrect. ALLOW Non-ionic equation with correct state symbols **(1)** Equations including spectator ions with correct state symbols **(1)** $Ag^+(aq) + Cl^-(aq) \rightarrow AgCl(s)$ **(1)**		**2**

Question Number	Correct Answer	Reject	Mark
1(d)	(The white precipitate) dissolves/ disappears OR a colourless solution is formed	**Just** "clear" instead of "colourless"	**1**

Question Number	Correct Answer	Reject	Mark
2(a)	(**The metal ion is**) barium/Ba^{2+} **(1)** (**The precipitate is**) barium sulfate/ BaSO$_4$ **(1)** ALLOW barium sulphate (**The gas is**) nitrogen dioxide/NO$_2$ **(1)** ALLOW dinitrogen tetroxide/N$_2$O$_4$ (**The gas which relights the glowing splint is**) Oxygen/O$_2$ **(1)** **Note:** If both name and formulae are given both must be correct Mark the four parts independently	**Just** "Ba" Ba$^+$	**4**

Question Number	Correct Answer	Reject	Mark
2(b)	Ba(NO$_3$)$_2$ ALLOW Ba(NO$_3$)$_2$.xH$_2$O where x is a number between 1 and 10 e.g. Ba(NO$_3$)$_2$.2H$_2$O		**1**

Question Number	Correct Answer	Reject	Mark
2(c)	2Ba(NO$_3$)$_2$ → 2BaO + 4NO$_2$ + O$_2$ Fully correct equation **(2)** Formulae of all three products correct **(1)** ALLOW multiples ALLOW 4BaNO$_3$ → 2Ba$_2$O + 4NO$_2$ + O$_2$ **(1)**		**2**

Question Number	Correct Answer		Reject	Mark
3(a)(i)	**(From)** orange	**(1)**	Two colours	**2**
	(To) green/blue/brown	**(1)**	e.g. "blue/green"	
			"blue-green"	

Question Number	Correct Answer		Reject	Mark
3(a)(ii)	$CH_3CH_2CH_2CH_2OH$	**(1)**	C_4H_9OH	**2**
	$CH_3CH(CH_3)CH_2OH/ (CH_3)_2CHCH_2OH$	**(1)**	Displayed	
	In either order		formula	
	Formulae may also be displayed or skeletal		with C-H-O	
			OR C-HO	

Question Number	Correct Answer	Reject	Mark
3(b)	$(CH_3)_3COH$		**1**
	ALLOW $CH_3COH(CH_3)CH_3$	Displayed	
	Formula may also be displayed or skeletal	formula	
		with C-H-O	
	ALLOW	OR C-HO	
	$CH_3CH_2CH_2OCH_3$		
	$CH_3CH(CH_3)OCH_3$		
	$CH_3CH_2OCH_2CH_3$		

Question Number	Correct Answer		Reject	Mark
3(c)(i)	**(From)** red-brown/ orange/yellow/brown	**(1)**	**Just** "clear"	**2**
	ALLOW Any combination of these colours			
	(To) colourless	**(1)**		

Question Number	Correct Answer	Reject	Mark
3(c)(ii)	ALLOW Addition of –Br and –OH across the double bond, in either order OR ALLOW Correct structural or skeletal formula		**1**

Question Number	Correct Answer	Reject	Mark
3(c)(iii)	steamy fumes/misty fumes/white fumes/cloudy fumes IGNORE dense	Any mention of "smoke", "solid" or "precipitate"	**1**

Question Number	Correct Answer	Reject	Mark
3(c)(iv)	IGNORE addition of HCl across the C=C double bond ALLOW Correct structural or skeletal formula		**1**

Question Number	Correct Answer	Reject	Mark
3(c)(v)	Alkene **(1)** ALLOW carbon-carbon double bond Alcohol/primary alcohol/hydroxy/hydroxyl/alkanol **(1)** In either order	Ethene, alkyl hydroxide	**2**

Question Number	Correct Answer	Reject	Mark
4(a)(i)	(25.0 x 4.18 x 10.0 =) 1045/1050/1000 (J) ALLOW 1.045/1.05/1.0 **kJ** IGNORE signs IGNORE sf except 1		**1**

Question Number	Correct Answer	Reject	Mark
4(a)(ii)	$\left(\dfrac{3.48}{100}\right)$ = 0.0348/0.035 (mol) IGNORE sf except 1		**1**

Question Number	Correct Answer	Reject	Mark
4(a)(iii)	$\left(\dfrac{\text{Answer to (a)(i) in kJ}}{\text{Answer to (a)(ii)}}\right) = \dfrac{1.045}{0.0348}$ = +30.03/30.0/30 (kJ mol^{-1}) ALLOW any answer which rounds to 30 to 2 sf. Mark CQ on (a)(i) and (ii) which should be checked. Value must round to the correct answer to 2 sf. Sign **(1)** value **(1)** Mark independently	1.0/0.035=29	**2**

Question Number	Correct Answer	Reject	Mark
4(b)(i)	Decrease (in temperature) for $KHCO_3$ **and** an increase (in temperature) for K_2CO_3 **(1)** OR Endothermic for $KHCO_3$ **and** exothermic for K_2CO_3 **(1)**	**Just** Temperature change different	**1**

Question Number	Correct Answer	Reject	Mark
4(b)(ii)	No heat lost/no heat gained/ reaction is complete/ specific heat capacity of the solution is the same as water/molar mass of $KHCO_3$ is 100 (not 100.1)/density of solution is 1.00 gcm^{-3}	Thermometer is accurate	**1**

Question Number	Correct Answer	Reject	Mark
4(c)(i)	$(\Delta H_r =)$ 2 x ΔH_1 — ΔH_2		**1**

Question Number	Correct Answer	Reject	Mark
4(c)(ii)	$(\Delta H_r = (2 \text{ x } +30) — (—34) =)$ + 94 (kJ mol^{-1}) value **(1)** sign **(1)** The sign mark is only available if the value is correct or almost correct. ALLOW $(\Delta H_r = (+30) — (—34) =)$ = +64 (kJ mol^{-1}) **(1)** IGNORE sf except 1		**2**

Question Number	Correct Answer	Reject	Mark
5(a)(i)	(Mass of contents after heating / g) **2.49**		1

Question Number	Correct Answer	Reject	Mark
5(a)(ii)	(Mass of water removed / g) **0.98**		1

Question Number	Correct Answer	Reject	Mark
5(b)(i)	$\dfrac{0.98}{18.0}$ = 0.0544 / 0.054/ 5.44 x 10^{-2}/ 5.4 x 10^{-2} (mol) IGNORE sig figs except ONE sf CQ on mass of water removed		1

Question Number	Correct Answer	Reject	Mark
5(b)(ii)	$\dfrac{2.49}{102.9}$ = 0.0242 / 0.024/ 2.42 x 10^{-2}/2.4 x 10^{-2} (mol) NaBr molar mass = 102.9/ 23.0+79.9 (g mol^{-1}) ALLOW 103 instead of 102.9 **(1)** answer **(1)** CQ on molar mass IGNORE sig figs except ONE sf CQ on mass of contents after heating		2

Question Number	Correct Answer	Reject	Mark
5(b)(iii)	(x = 0.0544/0.0242 = 2.2499) **x** = 2.2 to 2 sf ALLOW 2.3 answer **(1)** two sig figs **(1)** ALLOW 2.1,2.4,2.5 **(1)** ALLOW Either numerator 0.054 or denominator 0.024 and answer correct to 2 sf **(1)**		2

Question Number	Correct Answer	Reject	Mark
5(c)	$\left(\dfrac{2 \ x \ \pm \ 0.005 \ x \ 100\%}{3.47}\right) =$ 0.3% / 0.29% / 0.288% Ignore sf doubling the maximum error **(1)** answer **(1)** NOTE $\left(\dfrac{\pm \ 0.005 \ x \ 100\%}{3.47}\right) =$ 0.1% / 0.14% / 0.144% scores one only		**2**

Question Number	Correct Answer	Reject	Mark
5(d)(i)	**(Apparent mass of water removed)** decreases/less **(1)** **(Value of x)** decreases/less (than 2) **(1)** Mark independently		**2**

Question Number	Correct Answer	Reject	Mark
5(d)(ii)	**(Apparent mass of water removed)** increases/more **(1)** **(Value of x)** increases/ more (than 2) **(1)** Mark independently		**2**

Question Number	Correct Answer	Reject	Mark
5(e)	**Any two improvements from** • use a lid on the crucible • heat to constant mass • heat with a gentle/blue flame • use a larger mass of crystals • cool in a dry atmosphere • repeat experiment • electrical heating IGNORE "use a more accurate balance"	Heat loss	**2**

TOTAL FOR PAPER: 50 MARKS

Ofqual

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