

Mark Scheme (Results)

January 2014

International GCSE
Chemistry (4CH0) Paper 2C

Edexcel Level 1/Level 2 Certificates
Chemistry (KCH0) Paper 2C

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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.

Question number		Answer	Notes	Marks	
1	a	cross in box C (neutrons and protons)		1	
	b	i	6	1	
		ii	14	1	
	c	cross in box B (the numbers of electrons and protons are equal)		1	
	d	M1	same number of protons / (they both have) 6 protons	Ignore references to electrons	1
		M2	different numbers of neutrons / more neutrons	If number of extra neutrons specified, it must be 2 Reject different numbers of electrons Ignore references to atomic number and mass number	1
	e	cross in box B (2.4)		1	
TOTAL				7	

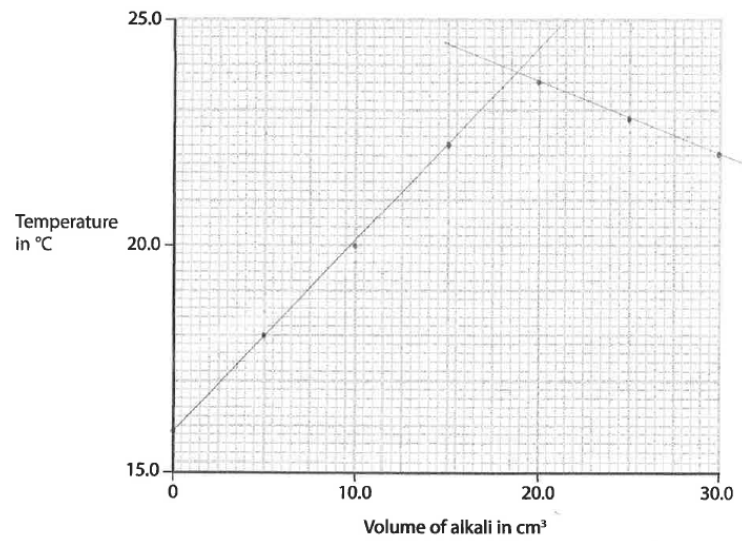
Question number		Answer	Notes	Marks	
2	a	bromine AND iodine	Accept symbols and formulae Do not accept names or formulae of ions	1	
	b	i	hydrogen chloride hydrochloric acid	Ignore gas Ignore aqueous / solution / dilute / concentrated Award 1 for both correct names in wrong places	1 1
		ii	M1 <u>white</u> smoke/solid/ cloud	Accept ring Reject precipitate Ignore powder / fumes	1
			M2 $\text{NH}_3 + \text{HCl} \rightarrow \text{NH}_4\text{Cl}$	Ignore state symbols	1
		iii	M1 <u>white</u> precipitate		1
			M2 aq s aq	Award 1 for s and 1 for both aq	2

Question number			Answer	Notes	Marks
2	c	i	hydrogen / H ₂	Ignore H	1
		ii	becomes smaller / disappears	Accept dissolves Ignore references to bubbles	1
		iii	acidic / contains (hydrochloric) acid / hydrogen ions / H ⁺ (ions)	Accept pH below 7 or any value below 7	1
		iv	not acidic / no (hydrochloric) acid (formed) / no hydrogen ions / no H ⁺ (ions) OR HCl/hydrogen chloride does not ionise / dissociate	Reject references to alkali(ne) or pH above 7 Ignore neutral Do not accept it/hydrochloric acid in place of HCl	1
TOTAL					12

Question number			Answer	Notes	Marks									
3	a	i	tungsten(VI) oxide / tungsten trioxide	Accept tungsten oxide Reject tungsten oxide with other oxidation numbers or prefixes such as mono- and di-	1									
		ii	(1) 3 (1) 3	Accept multiples and fractions	1									
		iii	loss of oxygen (by it / tungsten / tungsten oxide)	Accept decrease in oxidation number of tungsten Accept tungsten <u>ions</u> gain electrons	1									
	b	M1	<table style="margin-left: 20px;"> <tr> <td>Ca</td> <td>W</td> <td>O</td> </tr> <tr> <td>$\frac{13.9}{40}$</td> <td>$\frac{63.9}{184}$</td> <td>$\frac{22.2}{16}$</td> </tr> </table> <p>OR</p> <table style="margin-left: 20px;"> <tr> <td>0.348</td> <td>0.347</td> <td>1.39</td> </tr> </table>	Ca	W	O	$\frac{13.9}{40}$	$\frac{63.9}{184}$	$\frac{22.2}{16}$	0.348	0.347	1.39	Apply ECF 0/3 for use of any atomic numbers / division wrong way round / multiplication If division by 32 instead of 16 for O, then no M1, but M2 and M3 can score by ECF (CaWO ₂) If any transcription error (eg 69.3 in place of 63.9), then no M1, but M2 and M3 can score by ECF	1
Ca	W	O												
$\frac{13.9}{40}$	$\frac{63.9}{184}$	$\frac{22.2}{16}$												
0.348	0.347	1.39												
		M2	<table style="margin-left: 20px;"> <tr> <td>$\frac{0.348}{0.347}$</td> <td>$\frac{0.347}{0.347}$</td> <td>$\frac{1.39}{0.347}$</td> </tr> </table> <p>OR</p> <p>1 : 1 : 4</p>	$\frac{0.348}{0.347}$	$\frac{0.347}{0.347}$	$\frac{1.39}{0.347}$		1						
$\frac{0.348}{0.347}$	$\frac{0.347}{0.347}$	$\frac{1.39}{0.347}$												
		M3	CaWO ₄	Accept elements in any order Correct final answer scores 3	1									

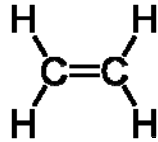
Question number				Answer	Notes	Marks
3	c	i	M1	$\frac{59.6 \times 184}{298}$	Award 1 for $n(\text{WF}_6) = 0.2 \text{ mol}$ and any sight of 0.2	1
			M2	36.8 (g)	No ECF from incorrect expression except for transcription error - eg using 289 instead of 298 ECF from incorrect number of moles Award 2 for correct final answer	1
		ii	M1	$\frac{47.5 \times 100}{52.0}$		1
			M2	91.3 (%)	Accept any answer in range 91 - 91.4 Do not penalise excessive numbers of dp Award 2 for correct final answer	1
TOTAL						14

Question number		Answer		Notes	Marks		
4	a	M1	concentration	Ignore from the same bottle	1		
		M2	temperature / same temperature as acid		1		
				Accept in either order Ignore references to volume			
	b	M1	19.4	Award 1 for both temperatures correct but in wrong order	1		
		M2	16.9		1		
		M3	(+)2.5		1		
				CQ on temperatures recorded Penalise negative sign			
c	i		cross in box D (The volume of acid used was 50.0 cm ³ instead of 25.0 cm ³)		1		
	ii		cross in box D (The alkali was added in 10.0 cm ³ portions but were recorded as 5.0 cm ³ portions)		1		
d		M1	all points plotted correctly to nearest gridline	Deduct 1 for each error If points not visible beneath line, assume them to be on the line	2		
		M2					
		M3				<u>straight</u> line of best fit through first 4 points	1
		M4				<u>straight</u> line of best fit through last 3 points	1
				Lines must be drawn with a ruler Penalise freehand once only ECF on incorrectly plotted points			



If first line drawn to (23.6,20.0), do not award M3
If lines do not cross or are joined by curve or straight line, only one of M3 and M4 can be awarded

Question number		Answer		Notes	Marks
4	e	M1	volume of alkali CQ on where lines cross	Accept answer to nearest gridline to min 1 dp	1
		M2	maximum temperature CQ on where lines cross	Accept answer to nearest gridline to min 1 dp	1
				Penalise missing dp once only If both values correct but in wrong order, award 1/2 0/2 if lines do not cross	
	f	i	M1	0.650×0.025	1
			M2	$0.01625 / 0.0163$	1
				16.25 scores 1/2 Accept 0.016 and 0.0162	
		ii	M1	0.0325	1
				CQ on fi	
		iii	M1	$\frac{0.0325 \times 1000}{0.500}$	1
			M2	65 (cm ³)	1
				If M1 wrong because $\times 1000$ missing, then award M2 by ECF	
				Penalise failure to use 1000 once only in i and iii Do not penalise rounding of intermediate answers and consequent final answer eg 65.2	
				If final answer obtained by use of $\frac{V_1 M_1}{n_1} = \frac{V_2 M_2}{n_2}$ both marks may be awarded in iii	
TOTAL					18

Question number			Answer	Notes	Marks
5	a		cross in box C (fractional distillation)		1
	b	M1	larger molecules in crude oil	Accept longer (chains)/ bigger M_r in place of larger Accept molecules in crude oil have wide range of sizes AND molecules in kerosene have similar sizes	4
		M2	more covalent bonds in crude oil (molecules) / bonds have different strengths	Accept no difference / same type of covalent bonding Reject references to double bonds in kerosene	
		M3	crude oil has higher viscosity	Accept less runny / less thick	
		M4	correct reference to other difference - eg crude oil darker colour crude oil harder to ignite crude oil burns with a smokier flame crude oil has a higher boiling point / wider range of boiling points		
				Any three points from four Accept converse statements for (molecules in) kerosene	
	c	i	C_9H_{20}	Accept $H_{20}C_9$	1
		ii	pentane		1
		iii		Ignore bond angles Ignore dot and cross diagram Ignore non-displayed formulae	1

Question number		Answer		Notes	Marks
5	d	M1	$ \begin{array}{cc} \text{H} & \text{Cl} \\ & \\ -\text{C} & -\text{C}- \\ & \\ \text{H} & \text{H} \end{array} $	M1 for 4 correct atoms joined to 2 C atoms (ignore C=C and extra atoms joined to C)	1
		M2		Accept Cl in any position of four	1
				M2 for all 7 bonds correct provided that continuation bonds are shown but have no atoms attached	
				Cl ₂ in place of Cl but otherwise correct scores M2 but not M1	
				Ignore brackets and any subscript	
	e	i	(in condensation polymerisation) a small molecule/H ₂ O/HCl is (also) formed /lost/released OR two (different) monomers / more than one product	Accept converse statement for addition polymerisation eg (only) one product formed / no atoms are lost/gained	1
				If no reference to type of polymerisation, assume that condensation is referred to	
		ii	M1 breakdown / decomposition	Ignore wear away / rot	1
			M2 by bacteria/microbes/micro-organisms	Accept biologically / naturally M2 dep on M1 or near miss	1
		iii	inert(ness)	Accept unreactive / non-polar Ignore strong bonds / long chains	1
TOTAL					13

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