Mark Scheme (Results)

Summer 2016

Pearson Edexcel International GCSE in Chemistry (4CH0 2C)

Pearson Edexcel Level 1/Level 2 Certificate in Chemistry (KCH0 2C)

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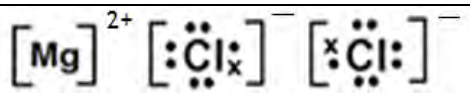
General Marking Guidance

- 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)	**M1** (X) – (stirring/glass/ plastic) rod **M2** (Y) – Bunsen (burner)	Accept stirrer Reject metal	2
(b) (i)	**C** (solvent)		1
(ii)	**B** (solution)		1
(c) (i)	2		1
(ii)	3		1
(d)	evaporated / went into the air	accept boils accept turns into vapour	1

Question number	Answer	Notes	Marks
2 (a)	**M1** iron reacted with oxygen **M2** all oxygen is reacted / (all) oxygen used up / no oxygen left	Accept iron combined/bonded with oxygen Accept iron oxide formed Accept iron is oxidised Ignore iron uses oxygen Ignore iron rusts Ignore references to reacting with water Accept references to 20% or 20cm^3 of the air which is oxygen used up/reacted Reject all iron used up Ignore reaction has finished	2
(b)	**M1** iron(II) sulfate / iron sulfate **M2** hydrogen	reject any other oxidation state	2

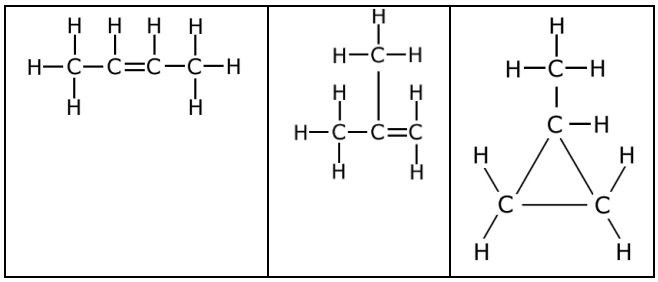
(c)	**M1** (Fe^{2+}) – green precipitate/solid **M2** (Fe^{3+}) – brown precipitate/solid	ignore shades reject other colours eg blue-green accept red-brown / orange brown Ignore rust coloured reject red on its own Allow 1 mark if both answers correct but reversed Ignore references to colours of solutions	2

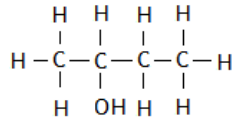
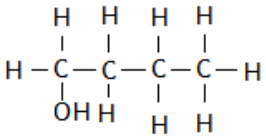
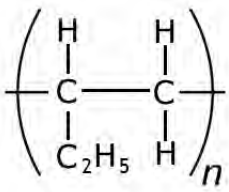
Question number	Answer	Notes	Marks
3 (a)		Ignore name and formula of compound	1
(i)	Na / sodium / Mg / magnesium	Accept aluminium If both name and formula given both must be correct	
(ii)	Si / silicon / P / phosphorus / S / sulfur / Cl / chlorine	If both name and formula given both must be correct	1
(b) (i)	 **M1** correct electronic configuration for magnesium ion and correct charge on ion **M2** correct electronic configuration for both chloride ions **M3** correct charges on both chloride ions	Allow electrons on brackets Allow any combination of dots and crosses Allow 0 or 8 electrons in outer shell M3 indep	3
(ii)	**M1** electrostatic attraction/forces between ions **M2** of opposite charge	accept positive	2

(iii)	**M1** attraction (between ions) is strong **M2** lots of ions (in structure) / giant structure / lattice / lots of/many bonds **M3** (therefore) lot of (thermal/heat) <u>energy</u> required to overcome attraction / to break down the lattice	and negative ions accept cations and anions M2 dep on M1 Accept attraction/forces between oppositely charged ions for 1 mark only Reject references to atoms/molecules/IMF for M1 and M2 Accept strong (ionic) bonding/strong (ionic) bonds Accept lot of (thermal/heat) <u>energy</u> required to break (ionic) bonds If any reference to attraction between atoms/molecules/electrons scores 0/3 If any reference to covalent bonding/covalent structure/IMF scores 0/3	3
(c)		Correct answer with or without working scores 2 marks	2

	M1 mol Al = 20/3 (= 6.67) **M2** mass Al = (answer to M1 x 27) = 180 (g) **OR** **M1** 3 faradays give 1 mol **OR** 27 g / 30 faradays give 10 mol OR 270 g **M2** 20 faradays gives 180 (g)	M2 CQ on M1 eg 540 scores 1 mark 6.67 gives 180(.09) scores 2 marks 6.7 gives 180.9 = 181 scores 2 marks 6.66 gives 179.82 scores M2 only Accept any number of sig fig except 1	

Question number	Answer	Notes	Marks
4 (a)	$CuO + 2HNO_3 \rightarrow Cu(NO_3)_2 + H_2O$	Ignore state symbols	1
(b) (i)	to increase the rate of <u>reaction</u>	ignore references to dissolving/solubillty	1
(b) (ii)	(copper(II) oxide/it) stops disappearing/ stays as a solid / forms as a solid (at the bottom of the beaker)	Accept stops dissolving / forms a suspension /forms a residue Accept when copper oxide remains/settles in the beaker Allow liquid goes cloudy/black ignore references to stops reacting ignore references to bubbling	1
(iii)	a drop of solution forms crystals when removed (and cooled)	Accept when crystals start to form/start to be seen Reject if all water evaporated	1
(iv)	(stage) 3	accept any reference to <u>first</u> filtration stage	1

Question number	Answer	Notes	Mark
5 (a) (i)	**M1** (compounds/molecules with the) same molecular formula /same number of each type of atom	Ignore references to chemical/general/empirical formula If use elements/atoms instead of compounds/molecules can score M2 only Allow reference to isomers in question ie have same number of carbon and hydrogen (atoms as each other)	2
	M2 but different displayed formula / structural formula / structures / arrangement of atoms	Ignore atoms in different order Ignore references to stereoisomerism	
(ii)		Accept structure of trans but-2-ene Ignore bond angles	1
	Any one for 1 mark		
(iii)	**M1** (Reagent) – bromine (water)		3
	M2 (But-1-ene) – goes (from orange) to colourless	accept decolourised Ignore clear/discolours	
	M3 (cyclobutane) – no change (unless UV light present)	accept stays orange ignore no reaction If start with bromine (water) in presence of UV light then scores 0/3	

(b) (i)	 OR 	Allow -O-H and -OH but not -HO	1
(ii)	 **M1** correct formula of repeat unit (with carbon to carbon single bond) **M2** brackets <u>and</u> continuation bonds <u>and</u> n	Accept displayed C_2H_5 Accept C_2H_5 on either C Allow if more than one monomer correctly joined together Accept n anywhere after brackets but not before M2 dep on M1or near miss	2

<table>
<tr><th>Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>6 (a)</td><td>titration / <u>volumetric</u> analysis</td><td></td><td>1</td></tr>
<tr><td>(b)</td><td>C (25 cm^3 pipette)</td><td></td><td>1</td></tr>
<tr><td>(c)</td><td>M1 (before) – yellow

M2 (after) - orange</td><td>

accept pink / red and combinations with orange
Allow 1 mark if correct colours reversed</td><td>2</td></tr>
<tr><td>(d)</td><td><table><tr><td>after adding acid</td><td>23.60</td></tr><tr><td>before adding acid</td><td>2.75</td></tr><tr><td>volume added</td><td>20.85</td></tr></table>
M1 23.60
M2 2.75
M3 20.85</td><td>If readings are correct but in the wrong order, award 1 mark for M1 and M2

M3 CQ on (M1 – M2)</td><td>3</td></tr>
<tr><td>(e) (i)</td><td><table><tr><td>22.90</td><td>22.60</td><td>22.45</td><td>22.55</td></tr><tr><td></td><td>✓</td><td>✓</td><td>✓</td></tr></table></td><td></td><td>1</td></tr>
<tr><td>(ii)</td><td>M1 (22.60 + 22.45 + 22.55) ÷ 3

M2 22.53 (cm^3)</td><td>Correct final answer with no working scores (2)
Accept 22.53 with 3 recurring

If no results ticked in (i), then only use of two or three concordant titres can score in (ii)

If only one result ticked, then no marks can be scored in (ii)
Otherwise, both marks CQ on ticked results in (e)(i)

Answer with zero as 2nd dp does not need trailing zero</td><td>2</td></tr>
</table>

		Answers obtained by averaging other titre values do require answers to 2 dp	

Question number	Answer	Notes	Marks
7 (a)	(refinery) gases		1
(b)	bitumen		1
(c) (i)	$C_{18}H_{38} \rightarrow C_8H_{18} + C_{10}H_{20}$ **OR** $C_{18}H_{38} \rightarrow C_8H_{18} + 2C_5H_{10}$ **OR** $C_{18}H_{38} \rightarrow C_8H_{18} + 5C_2H_4$		1
(ii)	**Any two from:** M1 over/greater supply of long chain hydrocarbons/molecules/ heavy/heavier fractions / OWTTE M2 high(er) demand/more use for short-chain/small hydrocarbons/ light/lighter fractions/ OWTTE M3 reference to a use eg the alkenes produced can be used to make polymers/plastics / eg the short-chain (saturated) hydrocarbons used as fuels	Accept reverse argument eg not enough short chain hydrocarbons Accept specific alkene and product eg ethene to make poly(ethene)/ethanol/alcohol Accept answers in terms of gasoline/petrol / fuel (for cars)	2
(d)	$C_8H_{18} + 8½O_2 \rightarrow 8CO + 9H_2O$ **M1** correct formula for CO **M2** correct balanced equation **M2** dep on **M1**	Allow multiples Accept balanced equations containing CO as well as C and/or CO_2 eg $C_8H_{18} + 6.5O_2 \rightarrow 4CO + 4C + 9H_2O$	2

Question number	Answer	Notes	Marks
8 (a)	**M1 (**mol $NaHCO_3$ =) 10.5/84 or 0.125 **M2** (so mass CO_2 = 0.0625 x 44 =) 2.8 (g) **OR** **M1** 168 g $NaHCO_3$ give 44 g CO_2 **M2** 10.5 g $NaHCO_3$ give 2.75 g CO_2	correct final answer with no working scores 2 accept 2.75 M2 CQ on M1	2
(b)	**M1** (mol CO_2 =) 2.75 ÷ 44 or 0.0625 **M2 (**0.0625 x 24000) = 1500 (cm^3)	correct final answer with no working scores 2 if answer is incorrect mark CQ to (a) CQ answer to M1 accept 1.5(00) $\underline{dm^3}$	2

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