

Mark Scheme (Results)

June 2014

Pearson Edexcel International GCSE
Chemistry (4CH0) Paper 1C
Science Double Award (4SC0) Paper
1C

Pearson Edexcel Level 1/Level 2
Certificate
Chemistry (KCH0) Paper 1C
Science (Double Award) (KSC0) Paper
1C

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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	Accept	Reject	Marks
1 (a)	B – (filter) funnel			1
	D – test tube/boiling tube			1
	E - pipette		teat pipette/dropping pipette	1
	F - beaker			1
(b)	M1 - A			1
	M2 - E			1

(Total marks for Question 1 = 6 marks)

Question number	Answer	Accept	Reject	Marks
2 (a) (i)	D - hydrocarbons			1
(b)	S U R V T First mark for S in box 1 <u>AND</u> R in box 3 Second mark for V in box 4 <u>AND</u> T in box 5			2

(Total marks for Question 2 = 3 marks)

Question number	Expected Answer	Accept	Reject	Marks
3 (a) (i)	12			1
(ii)	M1 – 2 M2 – two electrons in <u>outer/valence</u> shell Award M2 if M1 missing but not if incorrect Ignore references to magnesium and 2.8.2	roman numeral		1 1
(iii)	X ²⁺	Mg ²⁺		1
(b)	M1 – (79 x 24) + (10 x 25) + (11 x 26) M2 – divide by <u>100</u> M3 – 24.3 Mark M2 and M3 csq on M1 if one minor slip in numbers in M1 (eg 97 instead of 79 or 25 instead of 24) M3 dep on M2 Correct answer with no working scores 3 IGNORE units	(0.79 x 24) + (0.10 x 25) + (0.11 x 26) for 2 marks 24.32 with no working scores 2		1 1 1

(Total marks for Question 3 = 7 marks)

Question number	Answer	Accept	Reject	Marks
4 (a)	to increase the rate/speed (of the reaction) IGNORE to start the reaction/to provide energy/references to the copper(II) oxide will not react without heat / to make it dissolve faster / to give particles more energy	to overcome the activation energy/to provide <u>activation</u> energy (for the reaction)	Answers referring to copper instead of copper(II) oxide	1
(b)	it stops disappearing OR there is a (black) suspension/solid /copper(II) oxide OR the mixture/it turns cloudy/black IGNORE crystals	stops dissolving precipitate/ppt	any colour other than black	1
(c)	to remove (unreacted/excess) copper(II) oxide IGNORE references to impurities/crystals	to remove (unreacted/excess) solid to obtain a solution (of copper(II) sulfate)	to separate copper(II) oxide from sulfuric acid	1
(d)	copper(II) sulfate/the crystals are less soluble in cold water (than in hot water) OR solubility decreases with temperature IGNORE reference to water evaporating	reverse argument <u>ions</u> join together (to form a lattice) <u>ionic</u> lattice forms	references to freezing	1

(e)	blue IGNORE shades of colour		any colour other than blue	1
(f)	on filter paper/kitchen towel/tissue paper OR leave / in a warm place / in the sun / on a radiator / near a window / in a (warm/drying) oven	OWTTE desiccator	heat / hot oven	1

(Total marks for Question 4 = 6 marks)

Question number	Answer	Accept	Reject	Marks
5 (a)	(i) B	lower case letters		1
	(ii) D			1
	(iii) A			1
	(iv) C			1
(b)	M1 - (a substance) containing (two or more) elements IGNORE atoms for M1 only	<u>chemically</u> joined	mixture for M1 only molecules/particles bonded, etc for M1 and M2	1
	M2 – bonded (together) / <u>chemically</u> combined (in a fixed ratio)			1
(c) (i)	M1 - Na loses electron(s)			1
	M2 – Cl gains electron(s)			1
	M3 – Na becomes 2.8 AND chlorine becomes 2.8.8 If incorrect number of electrons transferred, max 2 IGNORE references to full shells max 1 for mention of covalent bonding All 3 marks can be scored from correct dot and cross diagrams showing electron transfer			1

(ii)	<p>M1 – Na = 23 <u>AND</u> Cl = 35.5</p> <p>M2 – 58.5</p> <p>M2 dep on M1</p> <p>IGNORE units</p> <p>Correct answer with no working scores 2</p>			<p>1</p> <p>1</p>
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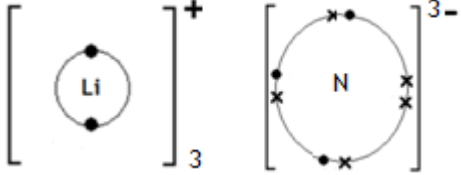
(Total marks for Question 5 = 11 marks)

Question number	Answer	Accept	Reject	Marks
6 (a)	(i) 13(.0)			1
	(ii) 1.4			1
	(iii) 25(.0)			1
(b)	indigo			1
	red			1
(c)	NaOH + HCl → NaCl + H ₂ O IGNORE state symbols even if incorrect	H ⁺ + OH ⁻ → H ₂ O		1

(Total marks for Question 6 = 6 marks)

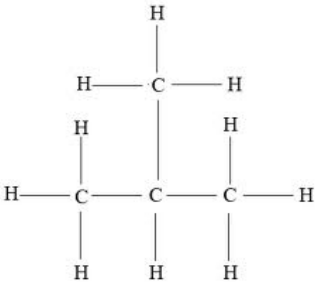
Question number	Answer	Accept	Reject	Marks
7 (a)	magnesium chloride/MgCl ₂ oxygen/O ₂ sulfuric (acid)/H ₂ SO ₄ IGNORE hydrogen sulfate If name and formula given, both must be correct	carbon dioxide/CO ₂		1 1 1
(b)	$\text{Mg} + \text{H}_2\text{O} \rightarrow \text{MgO} + \text{H}_2$ IGNORE state symbols even if incorrect Penalise incorrect symbols and failure to use subscripts			1

(Total marks for Question 7 = 4 marks)

Question number	Answer	Accept	Reject	Marks
8 (a)	 <p>M1 – for both electron diagrams correct IGNORE inner electrons of N even if incorrect</p> <p>M2 – for both charges correct</p> <p>M3 – for correct ratio of ions</p>	any combination of dots and crosses		3
(b)	$6\text{Li} + \text{N}_2 \rightarrow 2\text{Li}_3\text{N}$ <p>M1 – all formulae correct</p> <p>M2 – balanced</p> <p>M2 dep on M1</p> <p>IGNORE state symbols even if incorrect</p>	multiples and fractions		2
(c) (i)	<p>(i) l aq g</p> <p>(ii) M1 – any number from 8 to 14</p> <p>M2 – LiOH/lithium hydroxide is a base/alkali OR hydroxide <u>ions</u>/OH⁻ formed/present</p>	ammonia / <u>metal</u> hydroxides / <u>Group 1</u> hydroxides are bases/alkalis		1 1 1

(d)	ions cannot move OR ionic compounds <u>only</u> conduct when molten/in solution IGNORE references to electrons	ionic compounds do not normally conduct when solid		1
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(Total marks for Question 8 = 9 marks)

Question number	Answer	Accept	Reject	Marks
9 (a) (i)	A	Methane		1
(ii)	C	Ethene		1
(iii)	C	Ethene		1
(b)	M1 – (molecular) C ₄ H ₁₀ M2 – (empirical) C ₂ H ₅ ECF from molecular formula	H ₁₀ C ₄ H ₅ C ₂	CH ₃ CH ₂ CH ₂ CH ₃	1 1
(c) (i)	M1 – (name) alkane(s) M2 – (general formula) C _n H _{2n+2}			1 1
(ii)	 <p>IGNORE bond angles</p>		missing Hs and bonds	1

(d)	M1 – incomplete combustion/insufficient oxygen	lack of oxygen /less oxygen / <u>only</u> 1½ oxygen (in equation)		
	M2 – toxic/poisonous/causes death IGNORE dangerous/harmful			1
	M3 – reduces the capacity of the blood to carry oxygen IGNORE references to suffocation/cannot breathe IGNORE blood carries no oxygen	correct references to haemoglobin /blood carries less oxygen/blood does not release oxygen as easily		1 1

(Total marks for Question 9 = 11 marks)

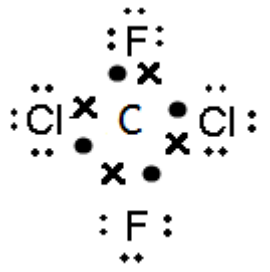
Question number	Answer	Accept	Reject	Marks
10 (a) (i)	Any two from: <ul style="list-style-type: none"> • good conductor <u>of heat</u> • high melting point • malleable Apply list principle			2
(ii)	M1 – ductile M2 – good conductor <u>of electricity</u> Apply list principle Answers can be given in any order			1 1
(b) (i)	strong(er) IGNORE references to density and rusting	other correct descriptions		1
(ii)	lower density / resists corrosion IGNORE lighter	does not rust greater strength to weight ratio		1
(c) (i)	heat / thermal energy / heat energy is given out OR transferred/lost to the surroundings IGNORE references to bond formation and breaking	produced produces an increase in temperature it gets hot		1
(ii)	M1 - (aluminium/it is) more reactive M2 – (aluminium/it) displaces iron (from its oxide) M2 DEP on M1	iron is less reactive replaces it/aluminium takes oxygen away from iron (oxide)		1 1

(iii)	M1 – aluminium	loses (three) electrons /oxidation number increases		1
	M2 – gains oxygen M2 DEP on M1 IGNORE references to magnesium	combines with oxygen / forms aluminium oxide		1
(d)	temperature reached \geq m.pt of iron IGNORE exothermic / heat produced / lots of energy produced	<u>high</u> temperature reached / gets <u>very</u> hot		1

(Total marks for Question 10 = 12 marks)

Question number	Answer	Accept	Reject	Marks
11 (a)	large hydrocarbons/alkanes/molecules become small ones IGNORE references to forming alkenes/ethene/more useful molecules	(large) hydrocarbons or alkanes or molecules become smaller ones long chains become short chains	references to polymers	1
(b)	M1 – (add to) bromine (water)/Br ₂ IGNORE Br M2 – (bromine) decolourised/turns colourless IGNORE starting colour and clear M2 dep on M1 , but can be scored for a near miss in M1 , eg Br or bromide (water)	(acidified) potassium manganate(VII) decolourised/turns colourless		1 1
(c)	M1 – (catalyst) silica / silicon dioxide / alumina / aluminium oxide N.B. if both name and formula given, mark the name only M2 – 600-700 °C	correct formula aluminosilicate / zeolite any value or range within this range equivalent temperatures in Kelvin		1 1

(Total marks for Question 11 = 5 marks)

Question number	Answer	Accept	Reject	Marks
12 (a) (i)	<p>M1 – divide all the masses by respective A_r</p> <p>M2 – to give 0.02 : 0.02 : 0.04</p> <p>M3 – (mole) ratio is 1 : 1 : 2 Correct ratio or empirical formula with no working scores 0/3</p>		division by atomic number/division upside down for all marks	1
	(ii) M1 – $204 \div 102 = 2$ OR $102 \times 2 = 204$	$(2 \times 12) + (2 \times 19) + (4 \times 35.5) = 204$		1
	M2 – $C_2F_2Cl_4$ Correct answer with no working scores 2 marks	symbols in any order	FI for F	1
(b)	 <p>M1 – all four bonding pairs correct</p> <p>M2 – rest of diagram correct</p> <p>M2 dep on M1</p>	FI for F any combination of dots and crosses		2

	IGNORE inner shell electrons even if incorrect Award 1 mark for similar molecules, eg CCl ₄ and CF ₄			
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(Total marks for Question 12 = 7 marks)

Question number	Answer	Accept	Reject	Marks
13 (a)	covalent			1
(b) (i)	<p>M1 – giant covalent / giant structure/lattice/network</p> <p>M2 – strong (covalent) bonds/many (covalent) bonds</p> <p>M3 – lot of (thermal/heat) energy required</p> <p>M4 – to <u>break</u> bonds</p>	macromolecular giant molecular	Max 1 if bonding stated to be intermolecular/ionic/metallic	1 1 1 1
(ii)	<p>M1 –intermolecular forces(of attraction) / forces (of attraction) between molecules</p> <p>M2 – are weak / little (thermal/heat) energy required (to overcome the forces)</p> <p>M2 DEP on M1 Weak bonds on its own = 0</p>	intermolecular bonds in place of intermolecular forces	any indication that covalent/ionic/metallic bonds are broken scores 0	1 1
(c)	<p><u>theory B</u> AND since there are no/fewer gas molecules in space</p> <p>OR</p> <p>there is no/less gas in space</p> <p>OR</p> <p>space is a vacuum</p>	<p>fewer gas molecules at high altitude/less gas at high altitude</p> <p>air/specified gas in place of gas</p> <p>ORA</p>		1

(d)	<u>high temperature</u> AND since (forward) reaction is endothermic/absorbs heat IGNORE references to le Chatelier's principle			1
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(Total marks for Question 13 = 9 marks)

(b)	Any two from M1 – (many) small molecules/monomers join up M2 - double bond becomes single bond/ it becomes saturated M3 – increase in mass/chain length/size	OWTTE double bond breaks and single bond forms		2
(c)	(i) inert(ness) IGNORE strong bonds / long chains (ii) M1 – produces greenhouse gases/toxic gases/poisonous gases M2 – (landfill) uses up land / takes up space OR new sites hard to find	unreactive/non-polar carbon dioxide		1 1 1

(Total marks for Question 14 = 9 marks)

Question number	Answer	Accept	Reject	Marks
15 (a) (i)	M1 – $M_r(\text{NaOH}) = 40$			1
	M2 – $10(.0) \div M1$			1
	M3 – 0.25 (mol) Correct answer with no working scores 3			1
	(ii) M1 – $0.25 \times 1000 \div 250$			1
	M2 – $1(.0) \text{ (mol/dm}^3\text{)}$ Correct answer with no working scores 2 Mark csq throughout			M3 from (a)(i) $\div 250 / 0.001$ for 1 mark

(b)	(i)	<p>M1 – (reading at end) 25.20</p> <p>M2 – (reading at start) 1.65</p> <p>M3 – (volume added) 23.55</p> <p>Award 1 mark for correct end and start readings in reverse order</p> <p>Mark M3 csq on M1 and M2</p> <p>Penalise lack of two decimal places once only in a correct answer</p>			1
	(ii)	<p>M1 – (colour at start) yellow</p> <p>M2 – orange/pink</p>	red		1
	(iii)	<p>different volumes can be measured /continuously graduated</p> <p>/ addition (of acid) can be controlled</p> <p>/ volume required is not known</p> <p>IGNORE references to precision or accuracy</p>	pipette measures one volume only		1
(c)	(i)	<p>M1 – $2(.00) \times 200 \div 1000$</p> <p>M2 – 0.4(0) (mol)</p> <p>Correct final answer with no working scores 2 marks</p>	400 for 1 mark		1
	(ii)	<p>M1 – $n(\text{CO}_2) = 0.2(0) / \frac{1}{2}$ of M2 from (c)(i) (mol)</p> <p>M2 – $\text{mass}(\text{CO}_2) = 8.8(0) \text{ (g)} / \text{M1} \times 44$</p> <p>Correct final answer with no working scores 2 marks</p>			1

(Total marks for Question 15 = 15 marks)

