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 **D** – test tube/boiling tube **E** - pipette **F** - beaker		teat pipette/dropping pipette	1 1 1 1
(b)	**M1 -** A **M2** - E			1 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 AND R in box 3 Second mark for V in box 4 AND 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	roman numeral		1
	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			1
(iii)	X^{2+}	Mg^{2+}		1
(b)	**M1** – (79 x 24) + (10 x 25) + (11 x 26)	(0.79 x 24) + (0.10 x 25) + (0.11 x 26) for 2 marks		1
	M2 – divide by <u>100</u>			1
	M3 – 24.3	24.32 with no working scores 2		1
	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			

(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) element<u>s</u> IGNORE atoms for **M1** only **M2** – bonded (together) /<u>chemically</u> combined (in a fixed ratio)	 <u>chemically</u> joined	mixture for M1 only molecules/particles bonded, etc for M1 and M2	1 1
(c) (i)	**M1** - Na loses electron(s) **M2** – Cl gains electron(s) **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 diagram<u>s</u> showing electron transfer			1 1 1

(ii)	**M1** – Na = 23 AND Cl = 35.5 **M2 –** 58.5 **M2** dep on **M1** **IGNORE units** **Correct answer with no working scores 2**			1 1

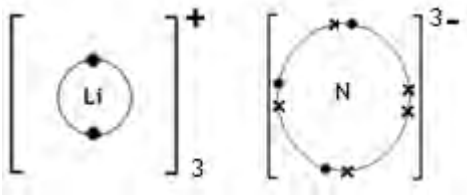
(Total marks for Question 5 = 11 marks)

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)	$NaOH + HCl \rightarrow NaCl + H_2O$ IGNORE state symbols even if incorrect	$H^+ + OH^- \rightarrow H_2O$		1

(Total marks for Question 6 = 6 marks)

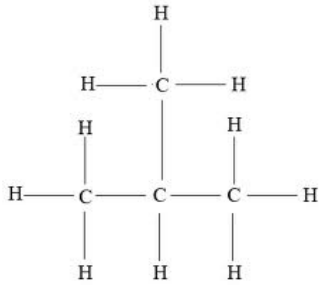
Question number	Answer	Accept	Reject	Marks
7 (a)	magnesium chloride/$MgCl_2$ oxygen/O_2 sulfuric (acid)/H_2SO_4 IGNORE hydrogen sulfate If name and formula given, both must be correct	 carbon dioxide/CO_2		1 1 1
(b)	$Mg + H_2O \rightarrow MgO + H_2$ IGNORE state symbols even if incorrect Penalise incorrect symbols and failure to use subscripts			1

(Total marks for Question 7 = 4 marks)

Question number	Answer	Accept	Reject	Marks
8 (a)	 **M1** – for both electron diagrams correct IGNORE inner electrons of N even if incorrect **M2** – for both charges correct **M3** – for correct ratio of ions	any combination of dots and crosses		3
(b)	$6Li + N_2 \rightarrow 2Li_3N$ **M1** – all formulae correct **M2** – balanced **M2** dep on **M1** IGNORE state symbols even if incorrect	multiples and fractions		2
(c) (i)	l aq g			1
(ii)	**M1 –** any number from 8 to 14			1
	M2 – LiOH/lithium hydroxide is a base/alkali **OR** hydroxide <u>ions</u>/OH^- formed/present	ammonia / <u>metal</u> hydroxides / <u>Group 1</u> hydroxides are bases/alkalis		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

(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_4H_{10} **M2** – (empirical) C_2H_5 ECF from molecular formula	$H_{10}C_4$ H_5C_2	$CH_3CH_2CH_2CH_3$	1 1
(c) (i)	**M1** – (name) alkane(s) **M2** – (general formula) C_nH_{2n+2}			1 1
(ii)	 IGNORE bond angles		missing Hs and bonds	1

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

(Total marks for Question 9 = 11 marks)

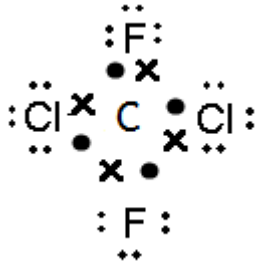
Question number	Answer	Accept	Reject	Marks
10 (a) (i)	Any two from: ● good conductor <u>of heat</u> ● high melting point ● malleable Apply list principle			2
(ii)	**M1** – ductile			1
	M2 – good conductor <u>of electricity</u> Apply list principle Answers can be given in any order			1
(b) (i)	strong(er) 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	iron is less reactive		1
	M2 – (aluminium/it) displaces iron (from its oxide) M2 DEP on M1	replaces it/aluminium takes oxygen away from iron (oxide)		1

(iii)	**M1** – aluminium **M2** – gains oxygen **M2** DEP on **M1** IGNORE references to magnesium	loses (three) electrons /oxidation number increases combines with oxygen / forms aluminium oxide		1 1
(d)	temperature reached ≥ m.pt of iron IGNORE exothermic / heat produced / lots of energy produced	high temperature reached / gets very 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 ºC	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)	**M1** – divide all the masses by respective A_r		division by atomic number/division upside down for all marks	1
	M2 – to give 0.02 : 0.02 : 0.04			1
	M3 – (mole) ratio is 1 : 1 : 2 Correct ratio or empirical formula with no working scores 0/3			1
(ii)	**M1** – 204 ÷ 102 = 2 OR 102 x 2 = 204	(2 x 12) + (2 x 19) + (4 x 35.5) = 204		1
	M2 – $C_2F_2Cl_4$ Correct answer with no working scores 2 marks	symbols in any order	Fl for F	1
(b)		Fl for F		2
	M1 – all four bonding pairs correct	any combination of dots and crosses		
	M2 – rest of diagram correct			
	M2 dep on **M1**			

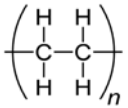
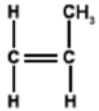
	IGNORE inner shell electrons even if incorrect Award 1 mark for similar molecules, eg CCl_4 and CF_4			

(Total marks for Question 12 = 7 marks)

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

(d)	high temperature AND since (forward) reaction is endothermic/absorbs heat IGNORE references to le Chatelier's principle			1

(Total marks for Question 13 = 9 marks)

Question number	Answer	Accept	Reject	Marks
14 (a)	**M1 –**  **M2** – any suitable use, eg: • plastic bags • buckets/bowls • storage bottles (for food, drinks, chemicals) • garden furniture • gas pipes • rubbish bins • storage tanks for fuel • cling film • packaging • clothing • insulation (for electric cables) Please research any unfamiliar use **M3 –** poly(propene) **M4** -  IGNORE bond angles	continuation bonds not going through brackets polypropene polypropylene methyl group attached to any carbon methyl group displayed	just plastic	1 1 1 1

(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	unreactive/non-polar		1
(ii)	**M1** – produces greenhouse gases/toxic gases/poisonous gases	carbon dioxide		1
	M2 – (landfill) uses up land / takes up space OR new sites hard to find			1

(Total marks for Question 14 = 9 marks)

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

(b)	(i)	**M1** – (reading at end) 25.20			1
		M2 – (reading at start) 1.65			1
		M3 – (volume added) 23.55 Award 1 mark for correct end and start readings in reverse order Mark **M3** csq on **M1** and **M2** Penalise lack of two decimal places once only in a correct answer			1
	(ii)	**M1 –** (colour at start) yellow			1
		M2 – orange/pink	red		1
	(iii)	different volumes can be measured /continuously graduated / addition (of acid) can be controlled / volume required is not known IGNORE references to precision or accuracy	pipette measures one volume only		1
(c)	(i)	**M1** – 2(.00) x 200 ÷ 1000			1
		M2 – 0.4(0) (mol) Correct final answer with no working scores 2 marks	400 for 1 mark		1
	(ii)	**M1** – $n(CO_2)$ = 0.2(0) / ½ of **M2** from (c)(i) (mol)			1
		M2 – mass(CO_2) = 8.8(0) (g) / **M1** x 44 Correct final answer with no working scores 2 marks			1

(Total marks for Question 15 = 15 marks)