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Mark Scheme (Results)

Summer 2013

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

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

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Summer 2013
Publications Code UG037094
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Question number	Answer	Notes	Marks
1 (a) i	5		1
ii	11		1
iii	5		1
iv	6		1
v	5		1
1 (b) i	more		1
ii	more		1
iii	the same number of		1
1 (c)	cross in box D (2.8.3)		1
		Total	**9**

Question number	Answer	Notes	Marks
2 (a) i	cross in box A (zinc sulfate)		1
ii	cross in box B (iron) cross in box C (magnesium)	Apply list principle - 3 crosses = max 1 4 or 5 crosses = 0 marks	1 1
2 (b)	burns with a pop/squeak OR use burning/lit splint/flame to see if pop/squeak	Must be reference to test and result Reference to splint/match with no indication of flame is not enough Reject reference to glowing splint Ignore flame extinguished 'Squeaky pop test' on its own is not sufficient	1
2 (c)	2 (1) 2	Accept multiples and fractions	1
2 (d) i	cross in box 3		1
ii	reversible / can go in both directions / can go backwards and forwards	Ignore references to equilibrium Ignore references to other reaction types (e.g. hydration / oxidation / exothermic) Accept either equation with ⇌	1
		Total	**7**

Question number	Answer	Notes	Marks
3 (a) i	gas / (g) / g	Accept equivalents such as gaseous / vapour Ignore colours	1
ii	darker / dark grey	Accept black Ignore references to states Ignore more intense Reject reference to any other colours	1

Question number	Answer	Notes	Marks
3 (b) i	no reaction (possible) / no displacement OR halogens do not react with their own halide ions	Accept no change Ignore references to lithium chloride containing chlorine / already reacted / OWTTE	1
ii	iodine/it is less reactive than bromine / bromine more reactive than iodine	Accept correct references to positions in (re)activity series Both halogens must be mentioned, except assume it refers to iodine Reject –ide endings Accept symbols and formulae Ignore references to only one element, e.g. iodine is unreactive Reject any comparison involving sodium	1
iii	iodine	Ignore references to states Ignore I and I_2	1
iv	cross in box D (bromine displaces iodine)		1
v	$2KCl + Br_2$	Either order Penalise incorrect symbols/numbers / unconventional formulae in this part, e.g. CL, br, Br^2, ClK	1
		Total	**7**

Question number	Answer	Notes	Marks
4 a	4 electrons shared between 2 (carbon) atoms	Ignore inner electrons even if wrong Ignore number of hydrogen atoms	1
	4 electron pairs between 2C and 4H atoms	Accept all permutations of dots and crosses Ignore intersecting circles Accept H atoms at all angles At least one C or one H atom must be labelled – max 1 if not Max 1 if more than 2 C atoms Max 1 if wrong number of electrons in outer shell of any atom	1

Question number	Answer	Notes	Marks
4 b i	setting out correct division of each % by A_r OR 3.2, 9.7 and 3.2 division by smallest /ratio of 1 : 3 : 1	Award 0/3 if division by any atomic numbers / wrong way up / multiplication used Do not penalise roundings and minor misreads of % values, eg 38 or 39 for carbon If molecular masses used for H and/or O, no M1, but can award M2 and M3 but no CQ in ii Using 2 and 32 gives C_2H_3O Using 1 and 32 gives C_2H_6O Using 2 and 16 gives $C_2H_3O_2$ Working required for these answers M2 subsumes M1	1 1
	CH_3O	Accept elements in any order Award 3 for correct final answer with no working No ECF from M2	1
		Accept use of 62 from ii, i.e. 62 × 0.387 = 24 etc scores M1 ratio scores M2, answer scores M3	
ii	$C_2H_6O_2$	Accept elements in any order No other answer acceptable	1
		Total	**6**

Question number	Answer	Notes	Marks
5 a i	haematite	Ignore iron oxide / formulae	1
ii	Al_2O_3 / $Al^{3+}{}_2O^{2-}{}_3$	Ignore reactants in equation	1
iii	carbon / C	Accept graphite Ignore coke / anthracite	1
	(positive/negative) electrode	DEP on M1 (including coke or any metal) Accept anode / cathode Accept references to letting electrons/electricity/current flow Accept references to letting electrons/electricity/current in/out of the cell/electrolyte Ignore references to attracting ions Accept references to conducting electricity Ignore references to electrolysis Ignore references to burning or combining with oxygen Ignore references to reduction/oxidation	1

Question number	Answer	Notes	Marks
5 iv	oxygen / O_2 production of heat/maintaining temperature of furnace OR formation of reducing agent /carbon monoxide	Accept O Ignore air DEP on mention of oxygen/O_2/O/air Ignore combustion/oxidation/reaction of carbon/coke Ignore references to <u>increasing</u> temperature of furnace	1 1

Question number	Answer	Notes	Marks
5 (b) i	redox		1
ii	(it/ Al^{3+}/aluminium ions) gain of electron(s) OR Al^{3+} combines/reacts with electrons	Reject gain of electrons by Al/aluminium Accept decrease in oxidation state Ignore/ references to gain of oxygen	1
iii	C / carbon gain of oxygen / O / O_2 OR reacts/combines/joins/bonds with oxygen or O or O_2 OR reduces water/H_2O	Accept graphite/coke DEP on M1 Ignore forms carbon monoxide Ignore references to loss of electrons Accept increase in oxidation state Ignore (acts as) reducing agent	1 1

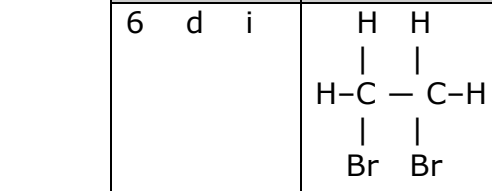
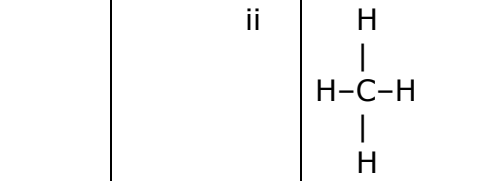
Question number	Answer	Notes	Marks
5 c i	(a substance that) increases rate of reaction / speeds up reaction / decreases time of reaction is (chemically) unchanged (at the end) OR mass does not change	 Accept is not used up / does not change Accept reference to lowering activation energy Ignore reference to alternative route Ignore references to yield Ignore reference to not reacting or taking part in reaction Reject reference to providing/increasing energy Reject reference to incorrect statement such as removes impurities	1 1
ii	(acts as) solvent (for alumina/aluminium oxide) OR to lower the (operating) temperature	Accept to lower melting point (of mixture/electrolyte) Reject to lower melting point of alumina/aluminium oxide/aluminium/bauxite Accept to reduce (heat) energy requirement Accept to increase the conductivity of the mixture/electrolyte/alumina Reject acts as a catalyst	1

Question number	Answer	Notes	Marks
5 d i	$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$	M1 for correct reactants and products M2 for balancing M2 dep on M1	1 1
ii	neutralisation	Accept acid-base Ignore all other descriptions	1
iii	slag		1
		Total	**17**

Question number	Answer	Notes	Marks
6 (a)	C	Accept formula of C	1
6 (b) i	(compound/molecule/substance containing) carbon and hydrogen (atoms/elements)	Reject atom/element in place of compound/molecule Reject compound/molecule in place of atoms/elements Reject mixture	1
	Only	M2 dependent on mention of carbon and hydrogen even if M1 not awarded Accept other terms with same meaning, e.g. solely / exclusively / just	1
	A	M3 independent Accept name/formula of A	1
ii	contains a (C=C) double bond	Accept multiple bond Ignore references to type of compound, eg hydrocarbon Reject double bond between C and H Do not penalise incorrect terms such as atom or element Ignore not all bonds are single Accept can undergo addition reactions Accept does not contain the maximum number of hydrogens/hydrogen atoms	1
	B	M2 independent Accept name/formula of B	1

	Answer	Notes	Marks
6 b iii	(compounds / molecules / substances with) same molecular formula / same number of each type of atom	Ignore same (chemical) formula /same compound No penalty for reference to hydrocarbons Reject same empirical/general formula If atoms or elements instead of compounds or molecules, only 1 of M1 and M2 can be awarded	1
	different structures /different structural/displayed formulae OR atoms arranged differently	Ignore different molecular arrangement	1
	C and F	Accept in either order Accept formulae of C and F	1

Question number	Answer	Notes	Marks
6 c i	same/similar chemical properties/reactions/behaviour/characteristics	Ignore specific examples such as react with oxygen Ignore similar (type of) reactivity Do not penalise reference to trends	2
	gradation / gradual change / trend / increase / decrease of physical properties	Accept reference to specific property, eg boiling point Reject same / similar physical properties Ignore variable physical properties	
	same functional group	Ignore reference to specific group	
	same general formula	Accept alkanes have the (general) formula C_nH_{2n+2} Reject same empirical/molecular formula	
		Any two for 1 each Accept two answers on one answer line Ignore any reference to properties not specified as physical or chemical	
ii	D AND E	Reject any other combinations Accept correct formulae	1

Question number	Answer	Notes	Marks
6 d i		Ignore bond angles and positioning of Br (as long as one on each C)	1
ii			1
		Total	**14**

Question number		Answer	Notes	Marks
7	a	reference to line/curve/temperature /graph/it AND not reached minimum / not constant / not level /not horizontal /still falling /decreasing/changing	Ignore reference to correlation Ignore has not reached zero / x-axis Ignore does not become	1
	b	(better) insulator (than glass) OR poor conductor (of heat)	Accept equivalents such as prevents heat from entering / keeps out heat better Allow stops heat escaping / traps heat Reject references to keeping temperature constant Ignore references to breaking glass	1
	c i	effervescence / fizzing / bubbles OR colourless solution/liquid formed	Accept carbon dioxide gas Accept gas given off/evolved/formed Ignore identity of gas Accept solid disappears/dissolves Ignore hissing and other sounds	1
	ii	Neutralisation	Accept acid-base / acid-alkali	1
		endothermic	M1 and M2 independent Accept answers in either order Do not penalise contradictions such as exothermic and endothermic – this answer is worth 1 mark	1

Question number	Answer	Notes	Marks
7 d i	product formulae or names / products (word) above reactants	Horizontal line not needed Ignore formula errors and one or two missing product(s) Ignore curves and intermediates	1
ii	(approximately) vertical line between reactants and products / between two levels AND labelled Δ*H* / energy change / heat change / enthalpy change	Ignore arrowheads on vertical line Ignore sign of Δ*H* Mark can be awarded for exothermic reaction Accept 2310 or any other number in place of Δ*H*	1

Question number	Answer	Notes	Marks
7 (e) i	temperature change = (–)5.5 (°C)	Award M1 for 5.5 anywhere	1
	heat change (= 100 × 4.2 × 5.5) = 2310/2300 (J)	CQ on candidate temperature change, provided other values correct Accept answer in kJ Ignore signs Correct final answer scores 2 2.31 (J) scores 1 mark if M1 not awarded	1
ii	concentration (of vinegar / (ethanoic) acid / CH_3COOH)	Ignore strength Ignore reference to M_r Accept concentration even if in an incorrect expression	1
		Total	**10**

Question number	Answer	Notes	Marks
8 (a)	mass surface area / size / volume	Accept weight Ignore length / width / height / thickness / shape / type Ignore temperature / purity / density	1 1
8 (b)	(2) time / how long (to collect gas) (3) number of / how many (marble) chips (4) volume of gas / how much gas collected (5) percentage / concentration (of acid)	Accept length of reaction/experiment Ignore amount of marble Accept amount of (marble) chips Accept carbon dioxide/CO_2 in place of gas Accept amount of gas Accept strength (of acid) Ignore volume of acid **Reject** amount (of acid)	1 1 1 1

Question number	Answer	Notes	Marks
8 (c) i	all six points plotted to nearest gridline	Deduct 1 mark for each error up to max 2, including extra points, but no penalty for point at 2.4 and 50%	2
	straight line of best fit	Line need not be extrapolated Must be drawn with a ruler CQ on candidate's plotted points	1
ii	anomalous point circled	at 1.5, 20 or CQ on candidate's line of best fit	1
iii	timer started late / stopped early	Ignore just wrong time	2
	concentration/% too high/more than 20%	Ignore just wrong concentration	
	marble chips bigger / more marble chips	Ignore just wrong mass/size	
	air in measuring cylinder before experiment started	Accept smaller volume of gas collected	
	(room) temperature higher		
		Ignore references to calculation Any two for 1 mark each M1 to M5 CQ on position of anomalous point, so if anomalous point below line of best fit, then: M1 timer started too early/stopped too late M2 concentration/% too low/less than 20% M3 marble chips smaller / fewer marble chips M4 larger volume of gas collected M5 (room) temperature lower	
iv	vertical line from 50% to drawn graph line	Accept short vertical line crossing graph line at 50% Accept point on graph line at 50%	1
	2.4 (cm^3/s)	CQ on drawn graph line but can be awarded without vertical line Do not penalise incorrect units	1
		Total	**14**

Question number	Answer	Notes	Marks
9 (a) i	beaker	Ignore qualifiers such as measuring / graduated / 250 cm^3	1
ii	Pipette	Ignore qualifiers such as measuring / graduated / 25 cm^3	1
iii	colour change is gradual /not sharp/not defined OR end point not sharp/defined/accurate	Ignore reference to many colours	1
	methyl orange / phenolphthalein / litmus	Accept other correct indicators Ignore reference to pH meter Reject litmus paper Ignore named colours and colour changes	1
iv	(measures) only one volume / fixed volume / 25 cm^3 has only one graduation mark OR cannot deliver (measured) variable volume OR volume required is not known OR cannot be controlled / hard to control	Ignore reference to accuracy / size Accept reverse arguments based on suitability of burette, eg burette can deliver/measure any volume	1

Question number	Answer	Notes	Marks
9 (b)	(after) 22.60		1
	(before) 2.75		1
	(added) 19.85	CQ on before and after readings Award 1 for before and after values both correct but in wrong order All values must be to 2 dp Penalise answers to other than 2 dp once only	1

Question number	Answer	Notes	Marks
9 (c) i	ticks in columns 3 and 4		1
ii	$\frac{23.35 + 23.45}{2}$	CQ on ticked results If no results ticked, award M1 if only columns 3 and 4 averaged If only 1 result ticked, then no marks can be awarded in (c)	1
	23.4(0)	CQ on results averaged Answer should be to 2 dp, except that trailing zero not needed Correct final answer without working scores 2	1

Question number	Answer	Notes	Marks
9 (d) i	divide/÷ by 1000 (not by 100) OR convert volume/cm^3 to dm^3 OR use 1000 instead of 100	Accept $\frac{0.0500 \times 23.60}{1000}$ (= 0.00118 mol) Accept divide (final) answer by 10	1
ii	multiply/× (amount of H_2SO_4) by 2 (not divide by 2)	Accept 0.(0)0118 × 2 (= 0.0(0)236 mol) Accept any other number in place of 0.0(0)118 Accept multiply (final) answer by 4	1
iii	divide by 25.0 (not by 23.60) OR divide by volume of KOH (not by volume of H_2SO_4) OR use 25.0/volume of KOH instead of 23.60/volume of H_2SO_4	Accept $\frac{0.00590 \times 1000}{25.0}$ (= 0.236 mol) Accept any other number in place of 0.00590 Must be positive statement about correction needed, e.g. in iii, ignore statement about volume of H_2SO_4 should not have been used	1
		Total	**14**

Question number	Answer	Notes	Marks
10 (a)	air / atmosphere		1
10 (b) i	(equilibrium / it) shifts to left/reactants	Accept favours reverse reaction Accept less product/ CO + (3)H_2 / lower yield Accept more reactant / CH_4 + H_2O	1
	fewer (gas) moles/molecules on left OR favours side with fewer moles/molecules	Accept opposite arguments, eg more moles on right Ignore references to volume and pressure Accept references to particles in place of molecules Reject atoms in place of molecules Ignore references to rate / collisions If wrong shift, M2 cannot be awarded If no shift, M2 can be awarded Marks can be awarded for both points in either prediction or reason	1
ii	(equilibrium / it) shifts to left/reactants	Accept favours reverse reaction/less product Accept less product/ CO_2 + H_2 / lower yield Accept more reactant / CO + H_2O	1
	(forward) reaction exothermic OR reverse reaction endothermic	Ignore references to rate If wrong shift, M2 cannot be awarded If no shift, M2 can be awarded Marks can be awarded for both points in either prediction or reason	1

Question number	Answer	Notes	Marks
10 (c)	Increased (rate) Increased (rate)	Accept alternatives such as faster reactions Accept alternatives such as faster reactions Ignore references to equilibrium/yield Ignore references to forward and reverse reactions	1 1

Question number	Answer	Notes	Marks
10 d i	M_r (NH_4NO_3) = 80 n (= $\frac{40000}{80}$)= 500 (mol)	Award M1 for 80 anywhere ECF from incorrect M_r 500 scores M1 and M2 0.5 (mol) scores only M1	1 1
ii	Answer to di / 500 (mol)		1
iii	M_r (NH_3) = 17 m = $\frac{500 \times 17}{1000}$ = 8.5 (kg)	Award M1 for 17 anywhere, except if result of incorrect calculation ECF from incorrect M_r Moles CQ on ii Accept answer in g if unit is given If no conversion from kg to g in i, and no conversion from g to kg in iii, penalise these errors once only Award 2 marks for 8.5 (kg)	1 1
10 e	phosphorus AND potassium	Accept in either order Ignore symbols Reject phosphate/phosphine	1
		Total	**13**

Question number	Answer	Notes	Marks
11 a i	delocalised electrons / sea of electrons move / flow (through structure) / mobile (when voltage/potential difference applied)	Ignore free electrons M2 needs mention of electrons, e.g. "electrons move/flow" scores M2 but not M1 Ignore references to carrying charge/current No penalty for references to aluminium atoms or ions / nuclei / protons, but any mention of these moving = 0/2	1
ii	layers/sheets/planes/rows AND (positive) ions/atoms/particles	Reject molecules/protons/electrons/nuclei	1
	slide (over each other)	Allow slip/flow/shift/roll/move/OWTTE in place of slide Do not award M2 if no mention of layers or equivalent Do not award M2 if protons/electrons/nuclei	1

Question number	Answer	Notes	Marks
11 b	NITROGEN (simple) molecular structure	Accept (nitrogen/N_2/small/discrete) molecules	1
	intermolecular forces (of attraction) / forces between molecules	Accept intermolecular bonds Reference to intermolecular also scores M1	1
	weak / easily overcome /need little energy to overcome	If any reference to breaking covalent bonds or any other type of bonding, only M1 can be awarded	1
	SILICA giant (structure)	Accept macromolecular Ignore lattice	1
	covalent (bonds)	Covalent can be anywhere in answer	1
	bonds strong / hard to break /need a lot of energy to break	If any reference to breaking intermolecular forces or any other type of bonding, only M4 can be awarded Any five for 1 mark each	1
		Total	**9**
		Total for paper	**120**

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Order Code UG037094 Summer 2013

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