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Mark Scheme (Results)

June 2011

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

INTERNATIONAL GCSE CHEMISTRY 4CH0/1C – SUMMER 2011

Question number	Answer	Notes	Marks
1 (a)	electron(s)		1
(b)	electron(s)		1
(c) (i)	protons (and) electrons	Accept in either order both answers	1
(ii)	protons		1
	neutrons		1
(d) (i)	12		1
(ii)	24		1
(iii)	2.8.2	Accept any other punctuation marks, such as , /) — and no punctuation marks	1

Total 8 marks

Question number	Answer	Notes	Marks
2 (a) (i)	element(s)		1
(ii)	compound		1
(iii)	mixture		1
(iv)	element		1
(b) (i)	solid		1
(ii)	gas		1

Total 6 marks

Question number	Answer	Notes	Marks
3 (a)	3		1
(b)	ammonia / NH_3 hydrogen chloride / HCl	Do not accept ammonium Do not accept hydrochloric acid Accept in either order. If name and formula given, both must be correct. Ignore state symbols, except HCl (aq)	1 1
(c)	ammonium chloride / NH_4Cl	Do not accept ammonia chloride. If name and formula given, both must be correct.	1
(d)	cross in box 2 (decomposition) cross in box 4 (neutralisation)		1 1

Total 6 marks

Question number	Answer	Notes	Marks
4 (a)	to stop the dyes from {dissolving / running / going / mixing} into water / smudging OWTTE	Ignore refs to correct statements eg "to allow water to rise up paper". Do not penalise refs to inks. Accept reverse argument based on what happens if water level is above dyes. Reject ref to reaction	1
(b) (i) (ii)	C and D insoluble	 Accept does not dissolve in water Reject ref to reaction Reject ref to not enough dye	1 1
(c)	52-55 67-68 0.76-0.82(1)	Penalise use of cm once only in M1 + M2 Do not penalise more than 2sf in M1 – M3 Accept 1sf in M3 M3 CQ on M1 + M2, even for $R_f > 1$	1 1 1

Total 6 marks

Question number	Answer	Notes	Marks
5 (a) (i)	7		1
(ii)	iodine / astatine	No penalty for giving both Accept formulae or symbols	1
(iii)	fluorine / chlorine	No penalty for giving both Accept formulae or symbols that clearly identify element Penalise –ide endings once only	1
(b) (i)	ions fixed/cannot move/not mobile/not free (to move) OR ions not fixed/can move/mobile/free (to move) when molten	Ignore "electrons cannot move (when solid)" Reject "electrons move (when molten)" Reject refs to atoms / molecules Ignore particles / covalent bonding	1
(ii)	because electron(s) lost (from bromide)	Reject bromine in place of bromide, but allow 'bromine ions' Ignore refs to number of electrons Assume "It" refers to bromide ions	1
(iii)	$Pb^{2+} + 2e^{(-)} \rightarrow Pb$	Ignore state symbols Reject $Pb^{2+} \rightarrow Pb - 2e^{(-)}$	1
	silver/grey/shiny (liquid)	Ignore solid Ignore metallic No CQ from wrong product in M1	1

5 (c)	M1	Na Br O 2.3 8.0 4.8 23 80 16	Award 0 for whole question if division by atomic numbers / wrong way up / multiplication used If molecular masses for Br and O used, no M1, but can award M2 & M3 If one error e.g. 32 instead of 23, no M1, but can award M2 & M3	1
	M2	0.1 0.1 0.3 OR 1 1 3		1
	M3	$NaBrO_3$	Consequential on M2 Accept elements in any order Correct answer scores 3 marks Max 2 if wrong symbol used for Na (eg N, S) or Br (eg B) If one or more elements missing, only M1 can be awarded	1

Total 10 marks

Question number	Answer	Notes	Marks
6 (a) (i)	iron(II) hydroxide sodium sulfate	Accept ferrous in place of iron(II) Accept in either order Ignore formulae even if wrong Max 1 if extra product added Ignore oxidation state of sulfate	1 1
(ii)	green precipitate	Ignore qualifiers such as pale / dark / dirty Accept solid / suspension / ppt(e) in place of precipitate Ignore grey Reject all other colours Reject bubbles or equivalent Ignore refs to turning brown Ignore refs to reaction type (eg displacement / oxidation) Ignore refs to solution turning colourless / clear Ignore refs to reactants Do not penalise wrong identity or formula of precipitate	1

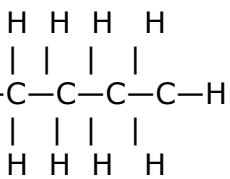
6 (b) (i)	barium sulfate / $BaSO_4$		1
(ii)	(dilute) hydrochloric acid / HCl	Accept other suitable acids (name or formula) such as HNO_3 / CH_3COOH Ignore hydrogen chloride Reject sulfuric acid Reject 'acid' alone Reject extra incorrect reagents	1
	fizzing / bubbles / effervescence	Allow gas Ignore carbon dioxide Ignore gas tests Ignore wrongly named gas Reject wrong observation (eg precipitate) M2 dep on M1 given Allow M2 if sulfuric acid or just 'acid' given in M1	1

6 (c)	M1	add sodium hydroxide (solution) (and warm)	Accept any named Group 1 or Group 2 hydroxide Addition of any other incorrect reagent means 0/3 If no reagent added, max 1 for correct test and result	1
	M2	test (gas/ammonia) with (damp red) litmus (paper) OR test with hydrogen chloride / conc. hydrochloric acid	Accept use of universal indicator paper Reject blue litmus for M2 and M3 Ignore 'ammonium' Accept HCl Reject dilute hydrochloric acid	1
	M3	turns blue OR <u>white</u> smoke / solid / powder	Do not award M3 if clear statement that litmus is dipped into solution Accept <u>white</u> fumes	1

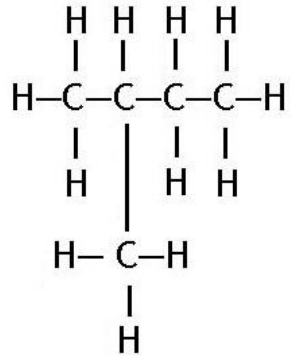
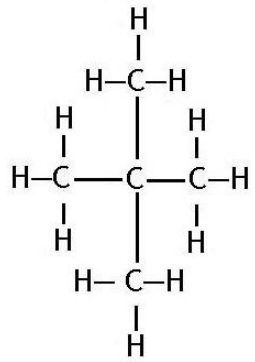
Total 9 marks

Question number	Answer	Notes	Marks
7 (a) M1	76 (cm^3)		1
M2	35 (cm^3)	Award 1 mark for M1 and M2 transposed	1
M3	41 (cm^3)	M3 CQ on M1 and M2 No penalty for use of values to 1 dp	1
(b) (i)	all points correctly plotted	Award marks for points plotted to the nearest gridline (or better) Deduct 1 mark for each error Award M1 + M2 if points not visible but line correct	2
	straight line of best fit	Line does not have to continue beyond points Allow straight line of best fit CQ on points plotted Line must not go to origin	1
(ii)	point circled at 165, 25		1
(c)	(blank 1) decreased (blank 2) decreased (blank 3) no change		1 1 1
(d)	$\frac{(140 - 111) \times 100}{140} = 20.7\ (\%)$	Award M1 for (140 – 111) or 29 Award M2 for correct final answer to 1 dp Correct final answer with no working scores 2 marks 20% / 21% with no working scores 0 79.3% scores 0 but could then be used to calculate 20.7, in which case 2 marks can be awarded	1 1

Total 12 marks

Question number	Answer	Notes	Marks
8 (a) (i)	CH_4	Accept H_4C	1
(ii)	C_2H_6	Accept H_6C_2	1
(iii)	$CH_3CH_2CH_3$	Accept CH_3-CH_2-CH_3 / H_3C-CH_2-CH_3	1
(iv)			1
(b) (i)	alkane(s)		1
(ii)	C_nH_{2n+2}	Accept x and other letters in place of n Accept answers like $C_nH_{2n}+2$ Ignore brackets that still give same answer	1
(iii)	similar chemical properties / characteristics / reactions / behaviour	Accept 'same chemical properties' but ignore a specific example, eg all react with oxygen	
	same functional group		
	(neighbouring members) differ by CH_2	Accept 'methylene group'	
	gradation/gradual change/trend in physical properties	Accept gradation/gradual change/increase/decrease in specified property, eg boiling point Reject same / similar physical properties	
		Accept any two for 1 mark each Accept two answers in lines 1 or 2	2

8 (c) (i)	$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$	All formulae correct Ignore balanced nitrogen on both sides Balancing dep on M1 Ignore state symbols Accept fractions and multiples	1 1
(ii)	carbon / C	Accept soot Ignore graphite Reject coke	1
	carbon monoxide / CO	Award 1 for both correct answers in wrong order	1

Question number	Answer	Notes	Marks
8 (d)		Accept in either order Award 1 mark for two correct isomers as structural formulae Award 1 mark for two correct isomers as skeletal formulae Ignore names	1
			1
(e) (i)	UV (light) / ultraviolet (light)	Accept sunlight Ignore ref to temperature	1
(ii)	bromomethane	Accept 1-bromomethane / methyl bromide / monobromomethane Ignore hyphens / spaces	1
(iii)	$CH_4 + Br_2 \rightarrow CH_3Br + HBr$	Award M1 for CH_3Br Award M2 for other formulae and correct balancing Max 1 for error in symbol e.g. BR, br Ignore state symbols Accept further bromination in (ii) and (iii)	1 1

Total 18 marks

Question number	Answer	Notes	Marks
9 (a) (i)	electrolysis		1
(ii)	carbon / graphite		1
(iii)	negative		1
(iv)	cryolite	Accept Na_3AlF_6	1
	solvent (for alumina) OR to lower operating temperature / to lower melting point of mixture / electrolyte	Reject to lower melting or boiling point of alumina / aluminium oxide / aluminium Ignore refs to boiling point of mixture / electrolyte Accept to reduce (heat) energy requirement Accept to increase conductivity of electrolyte ~~Ignore references to boiling point~~ Reject acts as catalyst M2 indep of M1	1
(b) (i)	oxygen / O_2	Ignore O	1
(ii)	decreases capacity of blood to carry oxygen	Accept correct reference to haemoglobin / oxyhaemoglobin / carboxyhaemoglobin Accept ref to CO bonding to red blood cells but not to <u>white</u> blood cells	1
(iii)	(pass through) limewater / calcium hydroxide solution	Ignore incorrect formulae eg CaOH Accept $Ca(OH)_2$ solution / $Ca(OH)_2(aq)$ but not just $Ca(OH)_2$	1
	turns milky / cloudy / white	Accept chalky / white ppte etc Ignore refs to later going clear M2 dep on M1	1

9 (c)	(i)	(positive) ions / cations / Al^{3+}	Do not accept atoms / negative ions / anions as alternative	1
		(delocalised) electrons		1
	(ii)	layers of ions/particles	Accept planes / sheets / rows Do not penalise atoms instead of ions here Reject molecules / protons / electrons	1
		slide over each other	Accept explanation in terms of non-directional bonding Do not award mark if wrong particles named, eg protons / electrons	1
	(iii)	delocalised / sea of electrons	Accept free	1
		move (through structure) / mobile	"ions free to move" scores 0	1
	(iv)	low density / high strength to weight ratio	Ignore light Accept lightweight / not dense	1

Total 16 marks

Question number	Answer	Notes	Marks
10 (a) (i)	silver chloride	Accept silver(I) chloride	1
(ii)	$AgNO_3$ + NaCl → AgCl + $NaNO_3$	Reactants = 1 Products = 1 Award 1 mark if all formulae correct but equation unbalanced Accept a correct ionic equation for 2 marks - Ag^+ + Cl^- → AgCl Ag^+ + Cl^- → scores M1 (but only with arrow)	1 1
(b)	s for $PbSO_4$ and aq for other three species		1
(c) (i)	(dilute) nitric acid / HNO_3 sodium hydroxide / NaOH	Accept sodium carbonate / sodium hydrogencarbonate / sodium bicarbonate Award 1 mark if both substances correctly identified but written in the wrong order If name and formula given, both must be correct.	1 1
(ii)	22.30 3.60 18.70	Penalise missing zeroes once only Award 1 for 2 correct readings in wrong order M3 CQ on M1 and M2	1 1 1
(d) (i)	ticks in boxes under columns 2 and 4		1
(ii)	$\frac{22.5(0) + 22.6(0)}{2}$ 22.55 (cm^3)	CQ on candidate's ticked results – if average of different results, then 0 If ticked results other than the correct ones, then final answer must be to 2 dp to score M2, but no penalty for missing trailing zeroes Average of 1 result scores 0 Correct answer with no working scores 2 marks	1 1

10 (e)	filter leave crystals to dry / dab crystals with filter paper/kitchen towel / warm (in oven)	Allow decant / pour off water Ignore washing Allow "leave to evaporate (rest of) water / leave to evaporate to dryness" for 2 marks If filter / decant / pour off water mark not scored, then marks can be awarded as follows: M1 leave in warm place/sun/on window ledge / heat or warm (in oven) M2 to evaporate/remove water/until dry No marks can be awarded if there is a statement about using strong heating or a bunsen burner	1 1

(f)	$NaNO_2$ M_r = 69 n ($NaNO_3$ / $NaNO_2$) = 0.02 OR $\frac{1.70 \times 69}{85}$ / $\frac{1.70 \times 138}{170}$ 1.38 (g)	Award mark if 138 seen ecf for incorrect M_r Accept 2sf or better Correct answer with no working scores 3 marks	1 1 1

Total 17 marks

Question number	Answer	Notes	Marks
11 (a)	breaking bonds absorbs energy / endothermic making bonds releases energy/exothermic more energy released than absorbed	 Ignore ref to numbers of bonds "more energy released in making bonds than absorbed in breaking bonds" scores 3 marks	1 1 1
(b) (i)	(from) white (to) blue $CuSO_4 + 5H_2O \rightarrow CuSO_4.5H_2O$	Reject colourless Ignore qualifiers such as pale / light / dark Award M3 for $CuSO_4$ and $CuSO_4.5H_2O$ Award M4 for $5H_2O$ No penalty for reversible arrow No penalty for missing dot Correct equation reversed = 1 mark Ignore state symbols If neither M3 not M4 awarded, then award 1 mark for correctly balanced equation using x or other number instead of 5	1 1 1 1
(ii)	(measure) boiling/freezing/melting point 100 ºC / 0 ºC	Accept just heat/distil/ boil/freeze the water Value must match property Accept º / C in place of ºC but do not award M2 if only value given Reject 'evaporates' by itself	1 1
(c) (i)	red	Allow pink	1
(ii)	more than one colour in acid / indicates pH / shows strongly or weakly acidic / shows how acidic the water is	Do not accept just more than one colour	1
(iii)	any value in range 1 – 6.9		1

Total 12 marks
PAPER TOTAL: 120 MARKS

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