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Mark Scheme (Results)

June 2011

IGCSE Chemistry (4CH0) Paper 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.

IGCSE CHEMISTRY 4CH0/2C – SUMMER 2011

Question number	Expected Answer	Accept	Reject	Marks
1	• Fizzing occurs (box 2) • potassium moves around (box 4) • potassium melts (box 5) • a lilac flame is seen (box 7) [If more than four boxes are ticked, deduct a mark for each incorrect answer above four]			1 1 1 1

Total 4 Marks

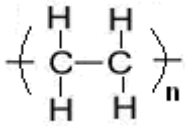
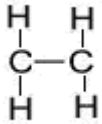
Question number	Expected Answer	Accept	Reject	Marks
2 (a)	iron			1
(b)	haematite			1
(c)	ammonia			1
(d)	sodium hydroxide			1
(e)	ammonia			1

Total 5 Marks

Question number	Expected answer	Accept	Reject	Marks
3 (a)(i)	Magnesium	Mg		1
(a)(ii)	It would react with the sulfuric acid / the clouds / the atmosphere / it will fizz	It is <u>too</u> reactive / <u>very</u> reactive / the <u>most</u> reactive Dissolve <u>in the</u> <u>(sulfuric) acid/ eq</u>	"reactive" by itself	1
(b)	it has low melting point / would melt / temperature on Venus is higher than the melting point of lead (ora) IGNORE heavy / dense	Lead would be a liquid Answer using data from table e.g. 328°C is lower than temp on Venus		1
(c)	Titanium Any two from: • it has a low density / is lightweight • it has a high melting point / wouldn't melt / temperature on Venus is lower than the melting point of titanium (ora) • does not react with sulfuric acid / the clouds / the atmosphere / it will not fizz	Ti The <u>probe</u> would be light Remains solid **Reason marks can be scored for copper (density mark would need to be compared to lead)**	Light on its own / light <u>in</u> weight on its own	1 1 1

Total 6 Marks

Question number	Expected answer	Accept	Reject	Marks
4 (a) (i)	Contains a (carbon to carbon) double bond / contains C=C / multiple bond IGNORE references to 'free' bond /spare bond	Can undergo addition reactions / does not contain the maximum number of hydrogen (atoms)		1
(ii)	(add) bromine (water) / Br_2 IGNORE references to any other solvent	$KMnO_4$ / potassium (per)manganate (VII) with either an acid or an alkali		1
	decolourised / turns (from orange/brown to) colourless IGNORE starting colour IGNORE clear IGNORE discolour	(purple to) colourless (if acid used) (purple to) green (if alkali used)		1
	2^{nd} mark dependent on 1^{st} mark having been awarded, but for near miss on reagent, e.g. bromine in presence of uv, observation mark can be awarded			
	Ignore references to any products, correctly named or otherwise			

4 (b) (i)	H_2O				1
(ii)	Dehydration	Elimination			1
(c)				Any double-bonded product scores 0/2	2
	 i.e. double to single	CH_2 - CH_2			
	1 mark for rest of formula, including extension lines, brackets and the 'n'	n as superscript		n before the brackets	
		Max 1 for skeletal formula			

Total 7 Marks

Question number	Expected answer	Accept	Reject	Marks
5 (a)	Any two from magnesium chloride, calcium chloride, iron(II) chloride If more than 2 given, deduct 1 mark for each incorrect answer If name and formula given, both must be correct	$MgCl_2$ / $CaCl_2$ / $FeCl_2$ / ferrous chloride / iron chloride	Iron(III) chloride / ferric chloride	2
(b)	To check the reliability / repeatability (of the results/method) IGNORE references to obtaining a mean / average IGNORE references to identifying anomalous results	To get concordant / consistent / precise results To increase the accuracy (of the results)	To increase the validity / to make it a fair test To increase the accuracy <u>of the method</u>	1
(c) (i)	4.30 circled			1
(ii)	Repeat the experiment IGNORE refs to validity / fair test	Discard / ignore this result Work out average only using other 2 results		1

5 (d)	Burette	Minor spelling mistakes, e.g. burrete / burete	Biuret	1
(e)	$\frac{(1.60 + 1.70 + 1.65)}{3}$ = 1.65 (2^{nd} mark consequential on 1st and can be awarded if small slip in data) Correct answer on its own scores 2	Award 1 mark for a correct average of the data for any other row except iron (II) chloride or water Award 1 mark for use of 1.90 and 1.95 to give 1.93	Any answer not to 2 d.p. (loses 2^{nd} mark only)	1 1

Total 8 Marks

Question number	Expected answer	Accept	Reject	Marks
6 (a)	Giant (structure / lattice / atomic / molecular) Covalent Idea that (covalent) bonds are broken (Covalent bonds) are strong / many bonds (are broken) / lots of {energy/heat} required **NB No penalty for referring to graphite**	Macromolecular	Max 2 for mentioning of ionic or metallic bonding or Intermolecular forces Bonds loosened	1 1 1 1
(b)	Layers slide / slip / move over each other IGNORE particles in layers such as atoms, but REJECT if ions / molecules / electrons for first mark only Weak (intermolecular forces of) <u>attraction</u> between layers / weak van der Waals (forces of attraction) between layers IGNORE references to bonds <u>within</u> the layers	Sheets / planes slide Any indication that the forces are those of attraction, e.g. forces overcome / forces are broken / forces hold the layers together	Rows slide Any reference to <u>bonds</u> between layers / molecules	1 1
(c)	Delocalised electrons (which) move / mobile / flow IGNORE references to "carrying" charge / current		Refs to atoms / ions / molecules scores 0/2	1 1

6 (d)	Any two from: Not a giant structure IGNORE simple molecular Weak intermolecular (forces of) <u>attraction</u> / weak (forces of) <u>attraction</u> between molecules / weak van der Waals (forces of attraction) between molecules No covalent bonds break (when melting)	Smaller molecules / simpler structure than diamond Any indication that the forces are those of attraction, e.g. forces <u>overcome</u> / forces <u>broken</u> / forces <u>hold</u> the molecules together First and third marking points can be awarded for correct comparisons between the two structures, e.g. buckminsterfullerene is simple molecular whereas diamond is giant covalent scores the first mark; weak intermolecular forces of attraction in buckminsterfullerene are broken as opposed to the covalent bonds in diamond (scores the 3rd mark, as well as the 2nd)	MAX 1 for any mention of covalent bonds are broken in Buckminster fullerene Any reference to <u>bonds</u> between molecules	2

Total 10 Marks

Question number	Expected answer	Accept	Reject	Marks
7 (a) (i)	108/24	1 mark for answer of 4.8(2) (molar volume = 22.4dm^3)		1
	= 4.5			1
(ii)	M_r of NaN_3 = 65	23 + (14 x3)		1
	Moles of NaN_3 = 3 OR two thirds of (a)(i)			1
	Mass of NaN_3 = 195 (g) OR moles of NaN_3 x M_r [Mark consequentially at each stage]	Correct answer with no working scores 3		1
(b) (i)	Removes (harmful) sodium	Produces <u>more</u> nitrogen / gas OR bag inflates more quickly		1
(ii)	$K_2O(s) + SiO_2(s) \rightarrow K_2SiO_3(s)$ OR $K_2O(s) + SiO_2(s) \rightarrow K_2SiO_3(l)$ IGNORE same numbers of Na_2O on both sides of equation			1
(c) (i)	Precipitation	<u>Double</u> decomposition	Double displacement	1
(ii)	Filtration / filter IGNORE refs to adding water	Decanting / pour off liquid	Sieving / evaporation / distillation / crystallisation / heat	1

Total 9 Marks

Question number	Expected answer	Accept	Reject	Marks
8 (a)	It (like water) is a colourless (liquid) IGNORE it is clear / transparent IGNORE references to smell	it looks the same		1
(b)	(Sulfuric acid / it) contains water	Aqueous (Copper sulfate) becomes hydrated	Contains hydrogen and oxygen / the elements of water	1
(c)	Pressure: > 1 but ≤ 5 (atm)	Any range within this range, including 1 – 2 atm	Values in alternative units	1
	Temperature: 350 to 550 (°C)	Any range within this range	Values in alternative units	1
	Catalyst: vanadium(V) oxide	Vanadium pentoxide / V_2O_5 / vanadium oxide / vanadium(5) oxide	other oxidation states	1

8 (d)	(i)	$\frac{30(.00) \times 0.2(00)}{1000}$	Correct answer with no working scores 2		1
		= 0.006(00)	6 for 1 mark only (i.e. not dividing by 1000)		1
	(ii)	0.003(00) OR (d)(i) ÷ 2			1
	(iii)	0.003(00) x 40 OR (d)(ii) x 40	Correct answer with no working scores 2		1
		= 0.12(0)	Award 1 mark for dividing d(ii) by 25 and correctly evaluating		1
					1
	(iv)	0.12(0) x 100 = 12(.0) OR (d)(iii) x 100			

Total 11 Marks
PAPER TOTAL: 60 MARKS

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