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IGCSE DA Chemistry 4437 5H
Mark Scheme (Results)
Summer 2008

IGCSE

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4437-5H MARK SCHEME

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
1 (a)(i)	electrolysis			**(1)**
1 (a)(ii)	graphite / carbon			**(1)**
1 (a)(iii)	– on left and + on right			**(1)**
1 (a)(iv)	aluminium oxide / alumina cryolite	accept correct formulae ignore bauxite		**1** **1** **(2)**
1 (a)(v)	electricity (ignore qualifications) / electrical energy (not energy alone)	Anode/positive electrode replacement	Cathode /electrode replacement	**(1)**
1 (b)(i)	oxygen			**(1)**
1 (b)(ii)	•carbon dioxide / carbon monoxide •graphite/carbon/electrode oxidised/burned/reacts with oxygen	accept correct formulae (ignore lower case)	lists equation	**1** **1** **(2)**
				9

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
2 (a)(i)	Any two from: •same or similar chemical properties / same functional group • gradation in physical properties •neighbouring/successive members differ by CH2	Gradation of specified physical property (eg: boiling point/bp(t), melting point/mp(t), viscosity)	NOT a specified chemical property different/same physical properties	**(2)**
2 (a)(ii)	alkene			**(1)**
2 (b)(i)	•(H) one electron shown •(C) two electrons in first shell and four in second shell	Accept any symbol for electrons.	Electrons on nucleus	**1** **1** **(2)**
2 (b)(ii)	•all five atoms and four shared pairs of electrons •no extra outer electrons.	IGNORE inner electrons		**1** **1** **(2)**
2 (c)(i)	•(compounds with) same molecular formula •(but) different structural formulae /displayed formula/structure / atoms arranged differently (same) elements = 0 marks	Mark independently	same chemical formula. Reject substances.	**1** **1** **(2)**

2 (c)(ii)	Correct structures of butane and methylpropane. ALL bonds shown Penalise sticks with missing H once only			**1** **1** **(2)**
				11
3 (a)(i)	any two from •effervescence / fizzing / bubbles • cloudiness / white precipitate /milky / white suspension •Ca get smaller / disappears (ignore dissolves). •Ca moves up and down	Ignore gas made ignore floats/moves	List	**(2)**
3 (a)(ii)	Ca(OH)2			**(1)**
3 (a)(iii)	•blue •alkali / OH^- / hydroxide / pH >7 (ignore base) •stated pH value in range 8-14		purple	**1** **1** **(2)**
3 (b)(i)	•grey / silver(y) •white			**1** **1** **(2)**
3 (b)(ii)	any two from •over/through water / downward displacement of water • (gas) syringe •upward delivery / downward displacement of air	a description of this suitable diagrams	gas cylinder	**(2)**
3 (b)(iii)	hydrogen + oxygen → water / steam	ignore heat	formulae	**(1)**
				10
4 (a)(i)	diffusion			**(1)**
4 (a)(ii)	•mention of particles (if particles named, must be correct) in correct context •moving (randomly)	(accept molecules/ ions) **move** (from high to low concentration)		**1** **1** **(2)**
4 (b)(i)	•(blue) ppt – colour not needed but penalise ppt if colour is wrong •deep/dark/royal blue •solution / dissolves	ignore changes to colour of solution	Dark/royal/deep blue ppt	**1** **1** **1** **(3)**
4 (b)(ii)	$[Cu(H2O)2(NH3)4]^{2+}$ / $[Cu(NH_3)_4(H_2O)_2]^{2+}$	Formulae without []		**(1)**
				7

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
5 (a)(i)	Any three from •float/on surface •fizz/bubble (ignore gas) •move/dart about •melt/form sphere/ball •Na gets smaller / disappears (ignore dissolves)	ignore references to flames / igniting	Apply list rule	**(3)**
5 (a)(ii)	2Na + 2H2O →2 NaOH + H2 •correct formulae •balancing (dependent on first mark being awarded)	Na(OH) any multiple		**(2)**
5 (a)(iii)	Moves/bubbles faster/(more) violent/more vigorous/catches fire/flame/ explodes		Reaction faster/ it is faster	**(1)**
5 (b)(i)	•sodium loses electron(s) • oxygen gains electrons •correct number of electrons for each atom marks could be gained by suitable additions to printed diagram	Indication of 2 Na and 1 O	Any reference to sharing /covalent gives O	**(3)**
5 (b)(ii)	•strong attractive forces / bonds (regardless of what these are between) •between **<u>ions</u>** •require a lot of energy to overcome / difficult to break (regardless of what these are between)		second mark not given if atoms / molecules / intermolecular	**1** **1** **1** **(3)**
				12

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
6 (a)	any five from: •add magnesium carbonate to acid •stir/mix •excess magnesium carbonate • filter / centrifuge and decant •heat or evaporate filtrate and stop evaporation at a suitable point / heat filtrate and leave to cool / leave filtrate to evaporate or to crystallise or for suitable time / place in oven below 100 °C •dry crystals with (filter) paper /desiccator	Ignore indicators •If use sodium carbonate (or other soluble carbonate)only points 2,5,6 •If use other insoluble carbonate, all bar first point. •Wrong method of prep. Then get 5 and 6 only.	Heat to dryness, can not get 5 or 6	**(5)**
6 (b)	•colourless •to pink	if just state "pink" with no start colour, then score 1	purple / red	**1** **1** **(2)**
				7
7 (a)(i)	•add (named) acid •bubbles/effervescence/fizzing OR gas produced turns limewater milky	2nd mark possible only if acid added		**1** **1** **(2)**
7 (a)(ii)	$2NaOH + CO2 \rightarrow Na2CO3 + H2O$ formulae = 1 balancing = 1 (only if formulae correct)	Accept any multiple		**(2)**
7 (b)(i)	•**M**r $NaHCO3 = 84$ •moles = 4.2 ÷ 84 •= 0.05(0) ignore any units Correct answer scores 3 If M_r incorrect, max 2 (107 gives 0.039; 168 gives 0.025)			**1** **1** **1** **(3)**
7 (b)(ii)	(i) ÷ 2 = 0.025 ignore any units	cq		**(1)**
7 (b)(iii)	(ii) x 24 (dm^3) =0.6 unit not required but penalise incorrect units.	cq	answer in cm^3	**(1)**
				9
8 (a)	any in range 40 to 100			**(1)**
8 (b)(i)	$H2 + Cl2 \rightarrow 2HCl$ formulae = 1 balancing = 1 (only if formulae correct) accept any multiples		CL	**(2)**

8 (b)(ii)	water: • paper becomes red (NOT orange) • acidic / H^+ ions produced methylbenzene: • no change / orange • no H+ ions formed / not acidic /does not ionise (indep. of colour)	red/orange ignore refs to being neutral	Orange Ionizes alone Green References to acidity of methyl benzene	**1** **1** **1** **1** **(4)**
				7
9 (a)(i)	galvanising / sacrificial protection			**(1)**
9 (a)(ii)	railings / cars /bridges / buckets / watering cans / lamp posts etc.	accept ships/boats even though zinc blocks and not a continuous layer used	bikes	**(1)**
9 (a)(iii)	•zinc more reactive (than iron) • zinc reacts/corrodes/oxidises in preference to /before /instead of iron	It is more reactive than iron	It is more reactive zinc rusts protective coating of zinc oxide	**1** **1** **(2)**
9 (b)	•zinc •loses electron(s) / oxidation number increases		If not zinc = zero	**1** **1** **(2)**
9 (c)	• make solution of nickel nitrate • add metal • if reaction occurs then metal is more reactive than nickel OR • work down from top of list until no reaction occurs / work up from bottom of list until reaction does occur.	Displacement reaction without making a solution is max 2	Reaction with anything else (such as HCl(aq)) is zero react with metal (for 2nd mark)	**1** **1** **1** **(3)**
				9
10 (a)	•Increased •endothermic (left to right) or description of endothermic / ΔH is positive	ignore references to rate	If decreased or stays the same = zero	**1** **1** **(2)**
10 (b)	• correct structure with minimum 4 carbons •continuation bonds shown (not just dots) (brackets not required)	Ignore "n" subscripts	any structure with C=C or based on wrong repeat unit = 0	**1** **1** **(2)**

<table>
<tr>
<td>10 (c)</td>
<td>
If calculate empirical first:
•Correct empirical formula with some correct working = 3
<table>
<tr><td>division by A_r</td><td>38.7/12 = 3.23</td><td>9.70/1 = 9.70</td><td>51.6 / 16 = 3.23</td></tr>
<tr><td>division by smallest</td><td>3.23 / 3.23 = 1</td><td>9.70 / 3.23 = 3</td><td>3.23 / 3.23 = 1</td></tr>
<tr><td>empirical</td><td colspan="3">CH_3O</td></tr>
</table>
•Correct molecular formula (with any correct working)= 2
<table>
<tr><td>mass of empirical</td><td>31</td></tr>
<tr><td>molecular</td><td>$C_2H_6O_2$</td></tr>
</table>
If calculate molecular first
<table>
<tr><td>mass of each element</td><td>38.7 x .62 = 24</td><td>9.70 x 62 = 6</td><td>51.6 x .62 = 32</td></tr>
<tr><td>division by A_r</td><td>24 / 12 = 2</td><td>6 / 1 = 6</td><td>32 / 16 = 2</td></tr>
<tr><td></td><td colspan="3">$C_2H_6O_2$</td></tr>
</table>
correct molecular with some working = 3

Correct empirical = 2
</td>
<td>If A_r incorrect/ use Z in place of A_r then lose first mark

If NO working shown, then max 1 each for the two answers regardless of order of answers</td>
<td>If first step totally wrong, zero.</td>
<td>1
1
1

2

1
1
1

2

(5)</td>
</tr>
<tr>
<td></td><td></td><td></td><td></td><td>9</td>
</tr>
</table>

PAPER TOTAL 90 MARKS