

IGCSE Chemistry 4335 2H

Mark Scheme (Results)

Summer 2008

IGCSE

IGCSE Chemistry 4335 2H

IGCSE CHEMISTRY 4335-2H 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)	<ul style="list-style-type: none"> •carbon dioxide / carbon monoxide •graphite/carbon/electrode oxidised/burned/reacts with oxygen 	accept correct formulae (ignore lower case)	lists equation	1 1 (2)
				9
2 (a)(i)	Any two from: <ul style="list-style-type: none"> •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 (a)(iii)	C _n H _{2n}	any other letter in place of "n"		(1)
2 (b)(i)	<ul style="list-style-type: none"> •(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)	<ul style="list-style-type: none"> •all five atoms and four shared pairs of electrons •no extra outer electrons. 	IGNORE inner electrons		1 1 (2)
2 (b)(iii)	tetrahedral			(1)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
2 (c)(i)	<ul style="list-style-type: none"> •(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)	<p>Correct structures of butane and methylpropane. ALL bonds shown</p> <p>Penalise sticks with missing H once only</p>			1 1 (2)
				13
3 (a)(i)	2			(1)
3 (a)(ii)	2.8.2			(1)
3 (b)(i)	<p>any two from</p> <ul style="list-style-type: none"> •effervescence / fizzing / bubbles • cloudiness / white precipitate /milky / white suspension •Ca get smaller / disappears (ignore dissolves). •Ca moves up and down 	<p>ignore gas made</p> <p>ignore floats/moves</p>	List	(2)
3 (b)(ii)	Ca(OH) ₂			(1)
3 (b)(iii)	<ul style="list-style-type: none"> •blue •alkali / OH⁻ / hydroxide / pH >7 (ignore base) •stated pH value in range 8-14 		purple	1 1 (2)
3 (c)(i)	<ul style="list-style-type: none"> •grey / silver(y) •white 			1 1 (2)
3 (c)(ii)	<p>any two from</p> <ul style="list-style-type: none"> •over/through water / downward displacement of water • (gas) syringe •upward delivery / downward displacement of air 	<p>a description of this</p> <p>suitable diagrams</p>	gas cylinder	(2)
3 (c)(iii)	hydrogen + oxygen → water / steam	ignore heat	formulae	(1)
				12

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
4 (a)(i)	ammonia / NH ₃		ammonium NH ₄	(1)
4 (a)(ii)	chloride / Cl ⁻		chlorine Cl Cl ₂	(1)
4 (a)(iii)	copper(II) / Cu ²⁺ / copper / cupric	copper	copper(I) cuprous Cu ⁺	(1)
4 (a)(iv)	iron(II) / Fe ²⁺ / ferrous		Fe ³⁺ ferric iron	(1)
4 (b)(i)	CuSO ₄ / copper(II) sulphate			(1)
4 (b)(ii)	<ul style="list-style-type: none"> •KNO₃ / potassium nitrate •lilac (dependent on correct compound) OR <ul style="list-style-type: none"> •CuSO₄ / copper(II) sulphate •green / blue-green (dependent on correct compound) 	potassium/C pink copper/B	purple blue	(2)
4 (c)(i)	yellow precipitate/ppt/ppte	suspension		(1)
4 (c)(ii)	AgNO ₃ (aq) + LiI(aq) → AgI(s) + LiNO ₃ (aq) LiI(aq) + AgNO ₃ (aq) formulae of products state symbols of products (dependent on correct product formulae)	if all correct but balanced wrongly, award 2 marks		(3)
				11
5 (a)(i)	diffusion			(1)
5 (a)(ii)	<ul style="list-style-type: none"> •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)
5 (b)(i)	<ul style="list-style-type: none"> •(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)
5 (b)(ii)	[Cu(H ₂ O) ₂ (NH ₃) ₄] ²⁺ / [Cu(NH ₃) ₄ (H ₂ O) ₂] ²⁺	formulae without []		(1)
				7

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
6 (a)(i)	Any three from <ul style="list-style-type: none"> •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		(3)
6 (a)(ii)	$2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2$ <ul style="list-style-type: none"> •correct formulae •balancing (dependent on first mark being awarded) 	Na(OH) any multiple		(2)
6 (a)(iii)	Moves/bubbles faster/(more) violent/more vigorous/catches fire/flame/ explodes		reaction faster/ it is faster	(1)
6 (b)(i)	<ul style="list-style-type: none"> •sodium loses electron(s) • oxygen gains electrons •correct number of electrons for each atom <p>marks could be gained by suitable additions to printed diagram</p>	indication of 2 Na and 1 O	any reference to sharing /covalent gives 0	(3)
6 (b)(ii)	<ul style="list-style-type: none"> •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)
6 (b)(iii)	<ul style="list-style-type: none"> •stronger attractive forces / bonding •magnesium ion 2+, sodium ion 1+ / magnesium loses 2 electrons, sodium loses 1 electron/magnesium ions are smaller or have bigger charge or are more highly charged (must state or imply comparison between Mg and Na) 	ignore more bonds/ intermolecular forces	MgO Covalent = 0 delocalised electrons = 0	1 1 (2)
				14

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
7 (a)	any five from: <ul style="list-style-type: none"> •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 <ul style="list-style-type: none"> •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)
7 (b)(i)	<ul style="list-style-type: none"> •colourless •to pink 	if just state "pink" with no start colour, then score 1	purple / red	1 1 (2)
7 (b)(ii)	<ul style="list-style-type: none"> •0.150 x 0.00870 •=0.00131 correct answer scores 2 (moles) 	incorrect or failure to convert volume to dm ³ gives max 1 accept 2 to 4 sig figs (0.001305)	wrong numbers used = 0	1 1 (2)
7 (b)(iii)	(ii) ÷ 2 = 0.000653 (moles)	cq on b(ii) accept 2 to 4 sig figs (0.006525)		(1)
7 (b)(iv)	(iii) ÷ 0.025 = 0.0261 (mol dm ⁻³)	cq on b(iii) accept 2 to 4 sig figs (0.02612)		(1)
				11

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
8 (a)(i)	<ul style="list-style-type: none"> •add (named) acid •bubbles/effervescence/fizzing OR gas produced turns limewater milky	2 nd mark possible only if acid added		1 1 (2)
8 (a)(ii)	$2\text{NaOH} + \text{CO}_2 \rightarrow \text{Na}_2\text{CO}_3 + \text{H}_2\text{O}$ formulae = 1 balancing = 1 (only if formulae correct)	accept any multiple		(2)
8 (b)	<ul style="list-style-type: none"> •no change / remains clear •carbon dioxide reacted / removed (by sodium hydroxide) / formed sodium carbonate / 			1 1 (2)
8 (c)(i)	<ul style="list-style-type: none"> •Mr NaHCO₃ = 84 •moles = $4.2 \div 84$ •= 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)
8 (c)(ii)	(i) $\div 2 = 0.025$ ignore any units	cq		(1)
8 (c)(iii)	(ii) $\times 24 \text{ (dm}^3\text{)} = 0.6$ unit not required but penalise incorrect units.	cq	answer in cm ³	(1)
				11
9 (a)	any in range 40 to 100			(1)
9 (b)(i)	$\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl}$ formulae = 1 balancing = 1 (only if formulae correct) accept any multiples		CL	(2)
9 (b)(ii)	water: <ul style="list-style-type: none"> • paper becomes red (NOT orange) • acidic / H⁺ ions produced methylbenzene: <ul style="list-style-type: none"> • 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 (4)
				7

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
10 (a)(i)	galvanising / sacrificial protection			(1)
10 (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)
10 (a)(iii)	<ul style="list-style-type: none"> •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)
10 (b)	<ul style="list-style-type: none"> • 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 2 nd mark)	1 1 1 (3)
10 (c)(i)	Reduced because gain of electrons	reduced because oxidation state decreases		(1)
10 (c)(ii)	<ul style="list-style-type: none"> •$Q=1.5 \times 160 = 240$(coulombs) •Faradays = $240 \div 96000 = 0.0025$ (cq) •Moles Ni = $0.0025 \div 2 = 0.00125$ (cq) • mass Ni = $0.00125 \times 59 = 0.074$ (g) (0.0737 or 0.07375) (cq). (0.0025 x 59 is max 3) units not required <p>Final answer correct = 4 marks</p>	Accept 2 or more sig figs (1 sig fig max 3) Accept use of 96500 0.00249 0.001245 0.07337	incorrect use of kg or mg	1 1 1 1 (4)
				12

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
11 (a)(i)	<ul style="list-style-type: none"> •appropriate catalyst alumina/aluminium oxide/porous pot/(conc) phosphoric acid / conc sulphuric acid.) •heat / high temperature 	ignore references to pressure 150 - 1000°C	aluminium	1 1 (2)
11 (a)(ii)	<ul style="list-style-type: none"> • correct energy level for endothermic (higher) and one from • products marked with correct names/formulae Mark independently	Ignore any activation energies shown		1 1 (2)
11 (a)(iii)	<ul style="list-style-type: none"> •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)
11 (b)	<ul style="list-style-type: none"> •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)

Question Number	Correct Answer	Acceptable Answers	Reject	Mark				
11 (c)	If calculate empirical first: •Correct empirical formula with some correct working = 3	If A_r incorrect/ use Z in place of A_r then lose first mark If NO working shown, then max 2 each for the two answers regardless of order	If first step totally wrong, zero.	1 1 1 2 1 1 1 2 (5)				
	<table border="1"> <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> </table>				division by A_r	$38.7/12 = 3.23$	$9.70/1 = 9.70$	$51.6/16 = 3.23$
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	<table border="1"> <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> </table>				division by smallest	$3.23 / 3.23 = 1$	$9.70 / 3.23 = 3$	$3.23 / 3.23 = 1$
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	<table border="1"> <tr> <td>empirical</td> <td colspan="3">CH₃O</td> </tr> </table>				empirical	CH ₃ O		
	empirical				CH ₃ O			
	•Correct molecular formula (with any correct working)= 2							
	<table border="1"> <tr> <td>mass of empirical</td> <td>31</td> </tr> <tr> <td>molecular</td> <td>C₂H₆O₂</td> </tr> </table>				mass of empirical	31	molecular	C ₂ H ₆ O ₂
	mass of empirical				31			
molecular	C ₂ H ₆ O ₂							
If calculate molecular first								
<table border="1"> <tr> <td>mass of each element</td> <td>$38.7 \times .62 = 24$</td> <td>$9.70 \times .62 = 6$</td> <td>$51.6 \times .62 = 32$</td> </tr> </table>	mass of each element	$38.7 \times .62 = 24$	$9.70 \times .62 = 6$	$51.6 \times .62 = 32$				
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<table border="1"> <tr> <td></td> <td colspan="3">C₂H₆O₂</td> </tr> </table>		C ₂ H ₆ O ₂						
	C ₂ H ₆ O ₂							
correct molecular with some working = 3 Correct empirical = 2								
				13				

PAPER TOTAL 120 MARKS