

Mark Schemes Summer 2009

IGCSE

IGCSE Chemistry (4335)

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IGCSE CHEMISTRY 4335-1F MARK SCHEME

Question			Mark	Acceptable answers	Notes	Total
1	a		M1	7		1

Question			Mark	Acceptable answers	Notes	Total
1	b		M1	B / boron		1

Question			Mark	Acceptable answers	Notes	Total
1	c		M1	protons and neutrons		1

Question			Mark	Acceptable answers	Notes	Total
1	d		M1	10		1

Question			Mark	Acceptable answers	Notes	Total
1	e		M1	Po / polonium AND At / astatine		1

Question			Mark	Acceptable answers	Notes	Total
2	a		M1	white / off white		1
			M2	blue		1

Question			Mark	Acceptable answers	Notes	Total
2	b		M1	exothermic		1
			M2	hydration	Accept "exothermic" if neither "exothermic" nor "endothermic" for M1	1
			M3	endothermic	If M1 = endothermic, then M3 must be exothermic. If M2 = dehydration, then M4 must be hydration M3 and M4 can be in reverse order	1
			M4	dehydration		1

Question			Mark	Acceptable answers	Notes	Total
3	a		M1	nitrogen	M1 and M2 pair can be interchanged with M3 and M4 pair	1
			M2	Air / atmosphere		1
			M3	hydrogen		1
			M4	water / steam / H ₂ O / hydrocarbons / natural gas / crude oil / cracking of naphtha / methane		1

Question			Mark	Acceptable answers	Notes	Total
3	b		M1	range 100 - 350 atm / value within that range	Allow equivalent pressures in other units Unit needed for mark	1
			M2	range 350 - 500 °C / value within that range	Allow 623 – 773 K Unit needed for mark	1
					If no units in M1 and M2, award 1 mark if both within specified ranges.	

Question			Mark	Acceptable answers	Notes	Total
3	c		M1 M2	nitric acid ammonium nitrate ammonium sulphate urea ammonium phosphate	Any two for 1 each	2

Question			Mark	Acceptable answers	Notes	Total
4	a	i	M1	halogen(s)	Reject halide(s)	1

Question				Mark	Acceptable answers	Notes	Total
4	a	ii	M1	iodine / astatine		Reject iodide and astatide	1

Question			Mark	Acceptable answers	Notes	Total
4	a	iii	M1	g		1
			M2	turns white / bleached / decolourised	Ignore references to red	1
			M3	colourless	Allow misty (fumes) Reject white	1
			M4	turns red / pink		1
			M5	colourless	Ignore clear	1
			M6	aq		1

Question			Mark	Acceptable answers	Notes	Total
4	b	i	M1	chlorine + sodium bromide → bromine + sodium chloride		1

Question			Mark	Acceptable answers	Notes	Total
4	b	ii	M1	displacement / redox / reduction / oxidation		1

Question		Mark	Acceptable answers	Notes	Total
4	c		M1 bromine less reactive than chlorine / chlorine more reactive than bromine / bromine is a poorer/weaker oxidising agent than chlorine / chlorine is a	Need reference to both elements Reject bromide and chloride	1

				stronger/better/more powerful oxidising agent than bromine		
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Question			Mark	Acceptable answers	Notes	Total
5	a	i	M1	evaporates		1
		ii	M1	condenses		1
		iii	M1	lower		1
		iv	M1	lower		1

Question			Mark	Acceptable answers	Notes	Total
5	b		M1	gasoline / petrol / petroleum spirit		1
			M2	diesel (oil)		1

Question			Mark	Acceptable answers	Notes	Total
5	c		M1	octane + oxygen → carbon dioxide + water	reactants	1
			M2		products	1

Question			Mark	Acceptable answers	Notes	Total
5	d		M1	carbon monoxide / CO		1
			M2	correct statement about effect on blood / haemoglobin	Ignore suffocation / asphyxiation Not dependent on M1	1

Question	Mark	Acceptable answers	Notes	Total
6	a	i	M1 Li	1
			M2 F ₂	1

Question	Mark	Acceptable answers	Notes	Total
6	a	ii	M1 Li ⁺	1
			M2 F ⁻	1
			Accept "Fl" as symbol if Fl used in a(i)	

Question	Mark	Acceptable answers	Notes	Total
6	b		M1 2 dots on inner circle	1
			M2 2 crosses on inner circle AND 7 crosses AND 1 dot on outer circle	1
				Electrons do not have to be paired

Question	Mark	Acceptable answers	Notes	Total
6	c		M1 fluorine because of electron gain	1
			M2 lithium because of electron loss	1
			Accept decrease in oxidation number	
			Accept increase in oxidation number	

Question	Mark	Acceptable answers	Notes	Total
7	a		M1	1
			M2	1
			KOH + HCl → KCl + H ₂ O	
			reactants	
			Products	
			Additional incorrect balancing max 1	

Question	Mark	Acceptable answers	Notes	Total
7	b		M1 lilac	1
			M2 yellow / orange	1
			M3 Cream/off white precipitate	1
			M4 silver bromide / AgBr	1
			M5 sodium nitrate / NaNO ₃	1
			Reject pink / purple	
			Reject any other colours	

Question			Mark	Acceptable answers	Notes	Total
8			M1	zinc		1
			M2	more reactive (than iron)	Accept higher in reactivity series / very reactive / more reactive than metal underneath / reacts with air or water in preference to iron Reject rusts	1
			M3	aluminium / duralumin / titanium		1
			M4	low density	Ignore light / strong / malleable	1
			M5	copper		1
			M6	(good electrical) conductor	Ignore ductile / conductor of heat	1
			M7	iron / steel	Reject stainless steel / cast iron	1
			M8	strong	Accept hard / tough / durable Ignore malleable	1
					4,6,8 dependent on M1,3,5,7 stainless steel given in M7, M8 ca red	

Question		Mark	Acceptable answers	Notes	Total
9	a		M1	Fr / francium	1

Question		Mark	Acceptable answers	Notes	Total
9	b		M1	NaF	1

Question			Mark	Acceptable answers	Notes	Total
9	c		M1	cross in 2nd box	If crosses in more than 3 boxes, then deduct 1 mark for each wrong choice	1
			M2	cross in 5th box		1
			M3	cross in last box		1

Question			Mark	Acceptable answers	Notes	Total
9	d		M1	more reactive down the group / less reactive up the group	Allow easier to react instead of more reactive Allow harder to react instead of less reactive Allow specific example, eg xenon more reactive than argon	1

Question			Mark	Acceptable answers	Notes	Total
10	a		M1	carbon and hydrogen (atoms)	Accept hydrocarbons described as compounds / molecules / substances Reject hydrocarbons described as elements Reject carbon and hydrogen described as molecules / compounds	1
			M2	only	Dependent on M1 containing carbon and hydrogen	1

Question			Mark	Acceptable answers	Notes	Total
10	b		M1	only single bonds / no double bonds (between carbon atoms)	If single bonds alternative chosen, then must contain only / solely / alone or equivalent	1

Question			Mark	Acceptable answers	Notes	Total
10	c		M1	alkane(s)		1

Question			Mark	Acceptable answers	Notes	Total
10	d		M1	two carbon atoms joined together by single bond		1
			M2	rest of structure correct	Must show 6 single bonds to H atoms dependent on M1	1
					Ignore names, non-displayed and general formulae	

Question			Mark	Acceptable answers	Notes	Total
10	e	i	M1	C ₄ H ₁₀	Allow H ₁₀ C ₄	1

Question			Mark	Acceptable answers	Notes	Total
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10	e	ii	M1	isomers		1
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Question			Mark	Acceptable answers	Notes	Total
10	f		M1	repeat unit showing single C-C bond and four C-H bonds	Accept one or any multiples, eg four carbon atoms	1
			M2	extension bonds and subscript n	Accept extension bonds as – or - Balancing for n must be correct CQ on M1	1

Question			Mark	Acceptable answers	Notes	Total
10	g	i	M1	condensation	Accept addition-elimination / polyamide Reject addition	1

Question			Mark	Acceptable answers	Notes	Total
10	g	ii	M1	cross in 3rd box	If crosses in more than 2 boxes, then deduct 1 mark for each wrong choice	1
			M2	cross in 4th box		1

Question		Mark	Acceptable answers		Notes	Total
11	a		M1	all green / green at bottom / green spreads out / water is green	more cloudy	1
			M2	crystals smaller/disappeared ' break up / disintegrate	Ignore dissolved	1
					ect bubbles Ignore water level drops	

Question		Mark	Acceptable answers		Notes	Total
C						
11	b		M1	diffusion		1

Question		Mark	Acceptable answers		Notes	Total
11	c		M1	colour spreads faster / more spread out / more is green / crystals dissolve faster / diffusion is faster	ect mention of reaction	1
			M2	particles/ions/molecules move faster/more energy	Ignore collisions	1

Question			Mark	Acceptable answers	Notes	Total
11	d		M1	(add) sodium hydroxide (solution)	Accept other Group 1 hydroxide, eg potassium hydroxide Accept calcium hydroxide (solid) but not limewater	1
			M2	(test gas evolved with damp) red litmus paper	Allow UI or neutral litmus instead of red litmus	1
			M3	turns blue	Accept purple only if UI used Accept pH > 7 or specified 7 only if UI used If definite statement that the indicator is put into solution then M3 cannot be scored	1
					M2 and M3 independent of M1	

Question			Mark	Acceptable answers	Notes	Total
12	a		M1	gain of oxygen / increase in oxidation number / loss of electrons		1

Question			Mark	Acceptable answers	Notes	Total
12	b	i	M1	$\text{SO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_3$	Accept multiples	1

Question			Mark	Acceptable answers	Notes	Total
12	b	ii	M1	hydrogen (ion) / (hydr)oxonium (ion) / H^+ / proton / H_3O^+		1

Question			Mark	Acceptable answers	Notes	Total
12	b	iii	M1	named indicator OR named metal carbonate or hydrogencarbonate OR named metal between Mg and H in reactivity series	Reject phenolphthalein / red litmus Accept limestone / marble (chips)	1
			M2	correct final colour of indicator OR effervescence / fizzing / bubbles	If UI, accept red/orange/yellow Ignore gas given off If no effervescence/fizzing/bubbles, then allow correct gas test (ie gas pops with burning splint or limewater turns milky, CQ on compound named in M1)	1

Question			Mark	Acceptable answers	Notes	Total
12	c		M1	increases / gets heavier		1
			M2	copper formed/sticks to it / copper plates	Must be copper, not copper ions M2 independent of M1 unless contradictory	1

Question			Mark	Acceptable answers	Notes	Total
12	d	i	M1	less reactive (than magnesium) / below magnesium in reactivity series	Reject less reactive than magnesium ions Reject copper ions less reactive Allow magnesium more reactive/higher in reactivity series (than copper)	1

Question			Mark	Acceptable answers	Notes	Total
12	d	ii	M1	blue	Ignore dark / pale	1
			M2	colourless / pale(r) blue	Ignore clear If pale blue in M1, then M2 must be colourless or paler blue	1
					Ignore bubbles If precipitate mentioned, then MAX 1	

PAPER TOTAL 100 MARKS

IGCSE CHEMISTRY 4335-2H MARK SCHEME

Question			Mark	Acceptable answers	Notes	Total
1			M1	zinc		1
			M2	more reactive (than iron)	Accept higher in reactivity series / very reactive / more reactive than metal underneath / reacts with air or water in preference to iron Reject rusts	1
			M3	aluminium / duralumin / titanium		1
			M4	low density	Ignore light / strong / malleable	1
			M5	copper		1
			M6	(good electrical) conductor	Ignore ductile / conductor of heat	1
			M7	iron / steel	Reject stainless steel / cast iron	1
			M8	strong	Accept hard / tough / durable Ignore malleable	1
					1,6,8 dependent on M1,3,5,7 stainless steel given in M7, M8 red	

Question		Mark	Acceptable answers	Notes	Total
2	a		M1	Fr / francium	1

Question		Mark	Acceptable answers	Notes	Total
2	b		M1	NaF	1

Question			Mark	Acceptable answers	Notes	Total
2	c		M1	cross in 2nd box	If crosses in more than 3 boxes, then deduct 1 mark for each wrong choice	1
			M2	cross in 5th box		1
			M3	cross in last box		1

Question		Mark	Acceptable answers	Notes	Total	
2	d		M1	more reactive down the group / less reactive up the group	Allow easier to react instead of more reactive Allow harder to react instead of less reactive Allow specific example, eg xenon more reactive than argon	1

Question		Mark	Acceptable answers	Notes	Total
3	a	M1	carbon and hydrogen (atoms)	Accept hydrocarbons described as compounds / molecules / substances Reject hydrocarbons described as elements Reject carbon and hydrogen described as molecules / compounds	1
		M2	only	Dependent on M1 containing carbon and hydrogen	1

Question		Mark	Acceptable answers	Notes	Total
3	b	M1	only single bonds / no double bonds (between carbon atoms)	If single bonds alternative chosen, then must contain only / solely / alone or equivalent	1

Question		Mark	Acceptable answers	Notes	Total
3	c	M1	alkane(s)		1

Question		Mark	Acceptable answers	Notes	Total
3	d	M1	two carbon atoms joined together by single bond		1
		M2	rest of structure correct	Must show 6 single bonds to H atoms dependent on M1	1
				Ignore names, non-displayed and general formulae	

Question		Mark	Acceptable answers	Notes	Total
3	e i	M1	C ₄ H ₁₀	Allow H ₁₀ C ₄	1

Question		Mark	Acceptable answers	Notes	Total
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3	e	ii	M1	isomers		1
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Question			Mark	Acceptable answers	Notes	Total
3	f		M1	repeat unit showing single C-C bond and four C-H bonds	Accept one or any multiples, eg four carbon atoms	1
			M2	extension bonds and subscript n	Accept extension bonds as – or - Balancing for n must be correct CQ on M1	1

Question			Mark	Acceptable answers	Notes	Total
3	g	i	M1	condensation	Accept addition-elimination / polyamide Reject addition	1

Question			Mark	Acceptable answers	Notes	Total
3	g	ii	M1	cross in 3rd box	If crosses in more than 2 boxes, then deduct 1 mark for each wrong choice	1
			M2	cross in 4th box		1

Question		Mark	Acceptable answers	Notes	Total
4	a		M1	all green / green at bottom / green spreads out / water is green	more cloudy
			M2	crystals smaller/disappeared ' break up / disintegrate	Ignore dissolved
					ect bubbles Ignore water level drops

Question		Mark	Acceptable answers	Notes	Total
C					
4	b		M1	diffusion	1

Question		Mark	Acceptable answers	Notes	Total
4	c		M1	colour spreads faster / more spread out / more is green / crystals dissolve faster / diffusion is faster	ect mention of reaction
			M2	particles/ions/molecules move faster/more energy	Ignore collisions

Question		Mark	Acceptable answers	Notes	Total
4	d		M1	(add) sodium hydroxide (solution)	Accept other Group 1 hydroxide, eg potassium hydroxide Accept calcium hydroxide (solid) but not limewater
			M2	(test gas evolved with damp) red litmus paper	Allow UI or neutral litmus instead of red litmus
			M3	turns blue	Accept purple only if UI used Accept pH > 7 or specified 7 only if UI used If definite statement that the indicator is put into solution then M3 cannot be scored
					M2 and M3 independent of M1

Question	Mark	Acceptable answers	Notes	Total
5	a	M1	gain of oxygen / increase in oxidation number / loss of electrons	1

Question			Mark	Acceptable answers	Notes	Total
5	b	i	M1	$\text{SO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_3$	Accept multiples	1

Question			Mark	Acceptable answers	Notes	Total
5	b	ii	M1	hydrogen (ion) / (hydr)oxonium (ion) / H ⁺ / proton / H ₃ O ⁺		1

Question			Mark	Acceptable answers	Notes	Total
5	b	iii	M1	named indicator OR named metal carbonate or hydrogencarbonate OR named metal between Mg and H in reactivity series	Reject phenolphthalein / red litmus Accept limestone / marble (chips)	1
			M2	correct final colour of indicator OR effervescence / fizzing / bubbles	If UI, accept red/orange/yellow Ignore gas given off If no effervescence/fizzing/bubbles, then allow correct gas test (ie gas pops with burning splint or limewater turns milky, CQ on compound named in M1)	1

Question			Mark	Acceptable answers	Notes	Total
5	c		M1	increases / gets heavier		1
			M2	copper formed/sticks to it / copper plates	Must be copper, not copper ions M2 independent of M1 unless contradictory	1

Question			Mark	Acceptable answers	Notes	Total
5	d	i	M1	less reactive (than magnesium) / below magnesium in reactivity series	Reject less reactive than magnesium ions Reject copper ions less reactive	1

					Allow magnesium more reactive/higher in reactivity series (than copper)	
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Question			Mark	Acceptable answers	Notes	Total
5	d	ii	M1	blue	Ignore dark / pale	1
			M2	colourless / pale(r) blue	Ignore clear If pale blue in M1, then M2 must be colourless or paler blue	1
					Ignore bubbles If precipitate mentioned, then MAX 1	

Question			Mark	Acceptable answers	Notes	Total
6	a		M1	C_nH_{2n}	Accept $H_{2n}C_n$ Accept other letters such as x	1

Question			Mark	Acceptable answers	Notes	Total
6	b		M1	$ \begin{array}{cc} H & H \\ \backslash & / \\ C & = & C \\ / & \backslash \\ H & H \end{array} $	Ignore bond angles Ignore names and molecular formulae	1

Question			Mark	Acceptable answers	Notes	Total
6	c		M1	yellow / orange	Ignore brown Reject red and any other colours	1
			M2	colourless / decolorised	Ignore clear	1

Question			Mark	Acceptable answers	Notes	Total
6	d	i	M1	water / steam / H ₂ O		1
			M2	phosphoric acid	more dilute / concentrated	1
			M3	high temperature / 200 – 400 °C / high pressure / 60 – 70 atm	Do not apply list principle	1

Question			Mark	Acceptable answers	Notes	Total
6	d	ii	M1	oxidation / reduction / redox		1

Question			Mark	Acceptable answers	Notes	Total
6	d	iii	M1	CH ₃ COOCH ₂ CH ₃ / CH ₃ COOC ₂ H ₅ / more detailed formula	Ignore H ₂ O Accept CH ₃ CO ₂ CH ₂ CH ₃	1
			M2	ester		1

Question			Mark	Acceptable answers	Notes	Total
7	a	i	M1	air	Accept atmosphere	1
			M2	water / steam / H ₂ O / natural gas / hydrocarbons / crude oil	Accept naphtha Reject sea water Ignore methane	1

Question			Mark	Acceptable answers	Notes	Total
7	a	ii	M1	$\text{N}_2 + 3\text{H}_2 \rightleftharpoons 2\text{NH}_3$	all species correct	1
			M2		balancing Accept multiples Accept → instead of ⇌	1
					dependent on M1 Ignore state symbols	
					If all species correct but either or both of + and ⇌ missing than award M1 but not M2	

Question			Mark	Acceptable answers	Notes	Total
7	b		M1 M2 M3	increased decreased increased	Allow other words with similar meanings	3
			M4 M5	decreased decreased	Allow other words with similar meanings	2

Question			Mark	Acceptable answers	Notes	Total
7	c	i	M1	cooled / temperature decreased	are compressed	1
			M2	liquefied / condensed / becomes a liquid	Reject liquidised are references to melting and ts / fractional distillation	1

Question			Mark	Acceptable answers	Notes	Total
7	c	ii	M1	recycled / recirculated / put back into reactor	re used again	1

Question			Mark	Acceptable answers	Notes	Total
7	d	i	M1	ammonium sulphate		1
			M2	$2\text{NH}_3 + \text{H}_2\text{SO}_4 \rightarrow (\text{NH}_4)_2\text{SO}_4$	formula of ammonium sulphate	1
			M3		everything correct Ignore state symbols M3 dep on M2	1

Question			Mark	Acceptable answers	Notes	Total
7	d	ii	M1	neutralisation / proton transfer / acid-base	Accept exothermic	1

Question			Mark	Acceptable answers	Notes	Total
8	a		M1	exothermic		1

Question			Mark	Acceptable answers	Notes	Total
8	b		M1	shared electron(s) (between atoms)	Reject between molecules	1
			M2	two/pair (of electrons) / attracted to nuclei (of atoms)	dependent on M1	1

Question			Mark	Acceptable answers	Notes	Total
8	c		M1	weak forces between molecules / intermolecular forces	Accept correctly intermolecular forces (ie Waals' forces / temporarily dipole-dipole attractions / forces / dispersion forces Reject bonds between atoms / bonds breaking	1
			M2	little energy needed to overcome	M2 dependent on M1	1
					If neither M1 nor M2 scored, allow 1 mark for boiling point lower than room temperature/lower than 30 °C	

Question			Mark	Acceptable answers	Notes	Total
8	d		M1	dot-and-cross pair between O and both H atoms	Allow any combinations of dots and crosses	1
			M2	four other electrons around O AND no more electrons around H	Ignore inner shell of oxygen Element symbols not needed, but if wrong then no marks -bonding electrons do not have to be paired M2 dependent on M1	1

Question			Mark	Acceptable answers	Notes	Total
8	e		M1	(bonds broken) 1368 / (2 × 436)		1

				+ 496		
			M2	(bonds formed) 1852 / 4 × 463		1
			M3	-484 (kJ/mol or kJ)	Correct final answer scores 3 marks 484 or +484 scores 2 marks Ignore units M3 CQ on (M1 – M2)	1

Question		Mark	Acceptable answers		Notes	Total
8	f		M1	reactants/(2)H ₂ + O ₂ shown above 2H ₂ O	e symbols not needed Ignore curves, vertical lines, ΔH data	1

Question		Mark	Acceptable answers		Notes	Total
8	g		M1	decreases / slower		1
			M2	decreases / closer	cept more tightly packed	1

Question		Mark	Acceptable answers		Notes	Total
8	h		M1	CuSO ₄ (s) + 5H ₂ O(l) → CuSO ₄ ·5H ₂ O(s)	CuSO ₄ AND CuSO ₄ ·5H ₂ O both correct	1
			M2		H ₂ O AND consequentially correct balancing Accept ⇌ in place of →	1
			M3		All state symbols correct, dependent on correct formulae (including CuSO ₄ ·2H ₂ O etc)	1

Question			Mark	Acceptable answers	Notes	Total
9	a		M1	atoms of same element / with same atomic number / with same number of protons	Do not award M1 if no mention of atoms are same number of electrons Reject different number of electrons ect compounds / molecules	1
			M2	different mass numbers / different numbers of neutrons	same mass number / atomic mass as contradiction of M2	1
					Accept amount / quantity in place of number	

Question			Mark	Acceptable answers	Notes	Total
9	b	i	M1	29 34	M1 is for BOTH 29 values	1
			M2	29 65	M2 is for 34	1
			M3		M3 is for 65	1

Question			Mark	Acceptable answers	Notes	Total
9	b	ii	M1	$\frac{(63 \times 69) + (65 \times 31)}{100}$ OR $(63 \times 0.69) + (65 \times 0.31)$ OR 43.47 + 20.15		1
			M2	63.6	CQ from their table values Ignore units Correct final answer to 1 dp scores 2 marks Correct final answer to wrong number of dp scores 1 mark (63.62)	1

Question			Mark	Acceptable answers	Notes	Total
9	c		M1	carbon / C		1
			M2	12	re position of 12	1

					Ignore (relative) atomic mass	
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Question			Mark	Acceptable answers	Notes	Total
9	d		M1	same number of (outer) electrons / isoelectronic / same electronic configuration	Ignore reference to same number of protons not award mark if no reference to number/amount/quantity etc	1

Question			Mark	Acceptable answers	Notes	Total
9	e		M1 M2	variable valency/oxidation state form coloured (compounds/solutions) form complexes / complex ions act as catalysts	Accept more than one combining power / differently charged ions / Cu ⁺ and Cu ²⁺ Any two for 1 mark each	2

Question			Mark	Acceptable answers	Notes	Total
9	f	i	M1	(from) green	Ignore dark / pale	1
			M2	(to) black	Reject any other colour A single correct colour with no indication of whether it is the starting or final colour does not score either M1 or M2	1
			M3	$\text{CuCO}_3(\text{s}) \rightarrow \text{CuO}(\text{s}) + \text{CO}_2(\text{g})$	reactants AND products AND correct balancing Accept multiples	1
			M4		all state symbols correct dependent on correct formula	1

Question			Mark	Acceptable answers	Notes	Total
9	f	ii	M1	$\text{CuO} + 2\text{HCl} \rightarrow \text{CuCl}_2 + \text{H}_2\text{O}$	reactants	1
			M2		products	1
			M3		balancing dependent on M1 and M2	1

					ore state symbols	
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Question			Mark	Acceptable answers	Notes	Total
9	g		M1	Cu ₂ O	ore names	1

Question			Mark	Acceptable answers	Notes	Total
10	a		M1	filter / centrifuge and decant	Accept allow (precipitate) to settle and pour off water	1
			M2	wash / rinse		1
			M3	warm / heat / leave to dry/to evaporate/in warm place	Accept mention of drying with filter paper / Bunsen burner / hairdryer / oven	1
					M2 and M3 dependent on attempt at M1	

Question			Mark	Acceptable answers	Notes	Total
10	b	i	M1	$5.55 \div 111$		1
			M2	0.05	ore units Correct answer scores both marks	1

Question			Mark	Acceptable answers	Notes	Total
10	b	ii	M1	0.05 / answer to (b)(i)	ore units	1

Question			Mark	Acceptable answers	Notes	Total
10	b	iii	M1	136	ore units	1

Question			Mark	Acceptable answers	Notes	Total
10	b	iv	M1	0.05×136 / answer to (b)(ii) $\times$ answer to b(iii)		1
			M2	6.8	Correct answer CQ on (b)(ii) and b(iii) scores both marks If (b)(ii) incorrect, accept 6.8 if evidence of using mass ratios Ignore units	1

Question			Mark	Acceptable answers	Notes	Total
10	c	i	M1	$0.04(00) \div 0.5$		1
			M2	0.08 dm^3	M2 dep on correct method for M1 (eg $0.4 \div 0.5 = 0.8 \text{ dm}^3$ scores M2 but not M1) Answer of 0.08 dm^3 scores M1 and M2	1
			M3	$80 \text{ (cm}^3\text{)}$	Unit not needed M3 CQ on M2 Correct final answer scores 3 marks	1

Question			Mark	Acceptable answers	Notes	Total
10	c	ii	M1	$(0.02 \times 24000 =) 480 \text{ (cm}^3\text{)}$		1

PAPER TOTAL 120 MARKS

IGCSE CHEMISTRY 4335-03 MARK SCHEME

Question			Mark	Acceptable answers	Notes	Total
1	a		M1	thermometer		1
			M2	condenser		1
			M3	round bottom flask		1
			M4	Bunsen (burner)		1
			M5	tripod		1

Question			Mark	Acceptable answers	Notes	Total
1	b		M1	thermometer / A		1

Question			Mark	Acceptable answers	Notes	Total
1	c		M1	cross in first box		1

Question			Mark	Acceptable answers	Notes	Total
2	a		M1	base line in ink/not in pencil		1
			M2	will interfere with results/run / smudge / will produce different colours / will move up paper/dissolve/mixed up with samples	Dependent on M1	1
			M3	water level too high / water too high / base line/spots under water /too much water / paper too low		1
			M4	ink will mix with water / dissolve in water / wash off paper/smudge/diffuse into water	Dependent on M3	1

Question			Mark	Acceptable answers	Notes	Total
2	b	i	M1	3		1

Question			Mark	Acceptable answers	Notes	Total
2	b	ii	M1	red AND green (in either order)	Do not award mark if yellow or blue are included	1

Question			Mark	Acceptable answers	Notes	Total
2	b	iii	M1	blue		1
			M2	did not move/ did not spread/ stayed on base line / not affected by water	Dependent on M1 Ignore does not separate	1

Question			Mark	Acceptable answers	Notes	Total
2	c	i	M1	2.1 – 2.4 cm / 21 – 24 mm		1
			M2	5.6 to 5.7cm/56 to 57mm		1
			M3	unit correct ONCE		1

Question			Mark	Acceptable answers			Notes	Total
2	c	ii	M1	red dist	solvent dist	R _f	CO on values in (c)(i) Ignore units	1
				2.1	5.6	0.375		
				2.2	5.6	0.392857143		
				2.3	5.6	0.410714286		
				2.4	5.6	0.428571429		
				2.1	5.7	0.368421053		
				2.2	5.7	0.385964912		
				2.3	5.7	0.403508772		
				2.4	5.7	0.421052632		
				1 or more sig figs				

Question		Mark	Acceptable answers	Notes	Total
3	a		M1 volume of acid M2 concentration of acid <u>starting</u> temperature (of acid) particle size/surface area/form of magnesium hydroxide stir same speed / stir in same way / stir for same time	ignore “amount of acid”– but if no other mark awarded give 1 mark for “amount of acid” not just “keep temp the same” – ignore, neutral reject mass of Mg(OH)_2 reject record maximum temperature after same length of time.	2

Question		Mark	Acceptable answers	Notes	Total
3	b		M1 insulate / use polystyrene cup/ wrap in (named) insulation /lid eg cotton wool / bubble wrap / mineral wool accept digital thermometer/ thermometer that has smaller divisions (may be specified)	ignore methods of measuring volume / finding mass / stirring	1
			M2 Reduces (accept “prevents”) heat loss / poor conductor (of heat) (Temperature) more accurate (allow “precise”) / read to more decimal places	Reject keeps temperature constant M2 dependent on M1	1

Question			Mark	Acceptable answers	Notes	Total
3	c		M1	21.5 21 ½		1
			M2	55(.0)		1
			M3	33.5 33 1/2	CQ on M1 and M2	1

Question			Mark	Acceptable answers	Notes	Total
3	d		M1 M2	7.5	Award 2 marks for 7.5 Award 1 mark for 7.53 LOOK IN THE TABLE	2

Question			Mark	Acceptable answers	Notes	Total
3	e		M1	too much (accept excess) magnesium hydroxide used magnesium hydroxide bigger surface area /smaller bits starting temperature of acid too high acid too concentrated	Reject volume of acid too big. Ignore non directional changes, reject wrong directional changes.	1

Question			Mark	Acceptable answers	Notes	Total
3	f		M1	2.5 (g)		1

Question			Mark	Acceptable answers	Notes	Total
3	g	i	M1 M2	all points plotted correctly	Tolerance of half small square Deduct 1 mark for each error	2
			M3	straight line through first 4 points	not freehand	1
			M4	straight line through last three points	ignore portion between 2g and 2.5g	1

Question			Mark	Acceptable answers	Notes	Total
3	g	ii	M1	goes up	temp increase (directly) proportional to mass gets M1 and M3 “they are proportional” is not sufficient for either M1 or M3	1
			M2	goes down	ignore references to where temperature increase ends/decrease starts	1
			M3	increase is (directly) proportional (can be expressed either way round) / decrease more slowly than increase	accept “goes up quickly and down slowly” or similar. “goes down slowly” without reference to increasing quickly is not sufficient.	1

Question			Mark	Acceptable answers	Notes	Total
4	a	i	M1	y-axis labelled (mass or g) and mass scale correct (4 cm rep 0.1 g)units not required	units on axis do not replace mass / volume labels	2
			M2	x-axis labelled (volume or cm ³) and volume scale correct (1 cm rep 1 cm ³)units not required	scales on each axis must consist of two or more numbers (one of which can be zero).	

Question			Mark	Acceptable answers	Notes	Total
4	a	ii	M1	A correct volume reading from either part of line (2.5 or 8.5/8.6)	units not required, but penalise wrong units once in M1 and M2	1
			M2	Correct units (cm ³)	Independent of M1	1
			M3	some CORRECT indication on graph for any one reading	correct construction with wrong value read off still scores M3	1

Question			Mark	Acceptable answers	Notes	Total
4	a	iii	M1	more readings between 4 and 6 cm ³ /around 5 / repeat between 4 and 6/around 5 smaller intervals between specified volumes as above accept list of suitable values. Accept answers based on more values around suitable mass of precipitate	Not just more readings or repeat not just “add 0.1cm ³ at a time” – must give indication of volume limits.	1

Question			Mark	Acceptable answers	Notes	Total
4	b		M1	weigh filter paper	can be implied (such as “use a filter paper of known mass” or after M4 “subtract the mass of the filter paper”)	1
			M2	filter		1
			M3	wash and dry	ignore how it is dried – an attempt at drying after washing is what is required	1
			M4	reweigh filter paper (with ppt)	M4 can only be awarded if the precipitate has been obtained by filtering	1

			M1	filter / centrifuge and decant		
			M2	wash and dry	ignore how it is dried – an attempt at drying after washing is what is required	
			M3	remove from filter paper / remove from centrifugation tube	this cannot be implied – it must be clear the precipitate is removed from the paper	
			M4	weigh (ppt)	M4 can only be awarded if the precipitate has been obtained, by filtering or centrifuging and decanting	

Question			Mark	Acceptable answers	Notes	Total
4	c	i	M1	zinc has the same results / metal could be zinc		1

Question			Mark	Acceptable answers	Notes	Total
4	c	ii	M1	add ammonia (solution) to excess /		1
			M2	White / precipitate (does not dissolve/remains)	M2 dependent on M1	1

PAPER TOTAL 50 MARKS

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