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**
					4,6,8 dependent on M1,3,5,7 **ainless 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_4H_{10}	Allow $H_{10}C_4$	1

Question			Mark	Acceptable answers	Notes	Total

3	**e**	**ii**	M1	isomers		**1**

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	~~re cloudy~~	**1**
			M2	crystals smaller/disappeared ' break up / disintegrate	Ignore dissolved	**1**
					ct 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	~~ct mention of reaction~~	**1**
			M2	particles/ions/molecules move faster/more energy	Ignore collisions	**1**

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	**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
5	**a**		M1	gain of oxygen / increase in oxidation number / loss of electrons		**1**

Question			Mark	Acceptable answers	Notes	Total
5	**b**	**i**	M1	$SO_2 + H_2O \rightarrow H_2SO_3$	Accept multiples	**1**

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

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	H H \ / C == C / \ H H	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_2O		**1**
			M2	phosphoric acid	**ore 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	$CH_3COOCH_2CH_3$ / $CH_3COOC_2H_5$ / more detailed formula	Ignore H_2O Accept $CH_3CO_2CH_2CH_3$	**1**
			M2	ester		**1**

Question			Mark	Acceptable answers	Notes	Total
7	a	i	M1	air	Accept atmosphere	1
			M2	water /steam / H_2O / natural gas / hydrocarbons / crude oil	Accept naphtha Reject sea water Ignore methane	1

Question			Mark	Acceptable answers	Notes	Total
7	a	ii	M1	$N_2 + 3H_2 \rightleftharpoons 2NH_3$	all species correct	1
			M2		balancing Accept multiples Accept $\rightarrow$ instead of $\rightleftharpoons$ **dependent on M1** Ignore state symbols	1
					If all species correct but either or both of + and $\rightleftharpoons$ 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	**~~re compressed~~**	1
			M2	liquefied / condensed / becomes a liquid	Reject liquidised **re references to melting an** **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	$2NH_3 + H_2SO_4 \rightarrow (NH_4)_2SO_4$	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 h** **aired** 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 $2H_2O$	~~**e symbols not needed**~~ Ignore curves, vertical lines, Δ*H* data	**1**

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

Question			Mark	Acceptable answers	Notes	Total
8	**h**		M1	$CuSO_4(s) + 5H_2O(l) \rightarrow CuSO_4.5H_2O(s)$	$CuSO_4$ AND $CuSO_4.5H_2O$ both correct	**1**
			M2		H_2O AND consequentially correct balancing Accept $\rightleftharpoons$ in place of $\rightarrow$	**1**
			M3		All state symbols correct, dependent on correct formulae (including $CuSO_4.2H_2O$ 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 **ore same number of electron** 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 M2 M3	29 34 29 65	M1 is for BOTH 29 values M2 is for 34 M3 is for 65	**1** **1** **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	**ore position of 12**	**1**

					Ignore (relative) atomic mass	

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** **nber/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	$CuCO_3(s) \rightarrow CuO(s) + CO_2(g)$	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	$CuO + 2HCl \rightarrow CuCl_2 + H_2O$	reactants	**1**
			M2		products	**1**
			M3		balancing **dependent on M1 and M2**	**1**

					ore state symbols	

Question			Mark	Acceptable answers	Notes	Total
9	**g**		M1	Cu_2O	**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 ÷ 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) x 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) ÷ 0.5		**1**
			M2	0.08 dm^3	M2 dep on correct method for M1 (eg 0.4÷0.5 = 0.8 dm^3 scores M2 but not M1) Answer of 0.08 dm^3 scores M1 and M2	**1**
			M3	80 (cm^3)	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 × 24000 =) 480 (cm^3)		**1**

PAPER TOTAL 120 MARKS