4437-5H 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	copper		**1**
			M4	(good electrical) conductor	Ignore ductile / conductor of heat	**1**
			M5	iron / steel	Reject stainless steel / cast iron	**1**
			M6	strong	Accept hard / tough / durable Ignore malleable	**1**
					,6 dependent on M1,3,5 **ainless steel given in M5, M6 c** **ed**	

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 **lependent 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
G						
4	**a**		M1	all green / green at bottom / green spreads out / water is green	~~ore 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	~~ect 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 pH 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**	**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
5	**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
5	**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
5	**c**	**i**	M1	cooled / temperature decreased	**~~ore compressed~~**	**1**
			M2	liquefied / condensed / becomes a liquid	Reject liquidised **re references to melting and** **ts / fractional distillation**	**1**

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

Question			Mark	Acceptable answers	Notes	Total
5	**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
5	**d**	**ii**	M1	neutralisation / proton transfer / acid-base	Accept exothermic	**1**

Question			Mark	Acceptable answers	Notes	Total
6	a		M1	shared electron(s) (between atoms)	Reject between molecules	1

Question			Mark	Acceptable answers	Notes	Total
6	b		M1	weak forces between molecules / intermolecular forces	Accept correctly named inte forces (ie van der Waals' temporarily induced dip attractions / London forces / 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
6	c		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 hav** **ed** M2 dependent on M1	1

Question			Mark	Acceptable answers	Notes	Total
6	d	i	M1	exothermic		1

Question			Mark	Acceptable answers	Notes	Total
6	**d**	**ii**	M1	negative / –		**1**

Question			Mark	Acceptable answers	Notes	Total
6	**d**	**iii**	M1	energy/heat needed to break bonds / bond breaking is endothermic		**1**
			M2	energy/heat released when bonds are formed / bond formation is exothermic		**1**
			M3	bonds in reactants are weaker than those in products / more energy released when bonds are formed than is needed to break bonds		**1**

Question			Mark	Acceptable answers	Notes	Total
6	**e**		M1	decreases / slower		**1**
			M2	decreases / closer	**~~ept more tightly packe~~**	**1**

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

Question			Mark	Acceptable answers	Notes	Total
7	**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
7	**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
7	**c**		M1	carbon / C		**1**
			M2	12	**re position of 12** Ignore (relative) atomic mass	**1**

Question			Mark	Acceptable answers	Notes	Total
7	**d**		M1	same number of (outer) electrons / isoelectronic / same electronic configuration	Ignore reference to same number of protons **ot award mark if no referenc** **ber/amount/quantity etc**	**1**

Question			Mark	Acceptable answers	Notes	Total
7	**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
7	f		M1	(from) green (solid) / colourless (solution)	**re clear**	1
			M2	(to) blue (solution)	Ignore pale / dark 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	$CuCO_3(s) + H_2SO_4(aq) \rightarrow CuSO_4(aq) + H_2O(l) + CO_2(g)$	reactants AND products AND correct balancing	1
			M4		all state symbols correct **lep on correct formulae in M3**	1

Question			Mark	Acceptable answers	Notes	Total
7	g	i	M1	$Cu(OH)_2$	**ept $Cu(H_2O)_4(OH)_2$** **ept correct formula in incorrec** **ation**	1
			M2	blue	**re pale** Reject dark / royal / navy	1

Question			Mark	Acceptable answers	Notes	Total
7	g	ii	M1	precipitate dissolves / forms solution		1
			M2	dark/deep/royal/navy blue	Dark etc blue solution scores both marks even if precipitate mentioned as still present **re inky**	1

Question			Mark	Acceptable answers	Notes	Total
8	**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
8	**b**	**i**	M1	5.55 ÷ 111		**1**
			M2	0.05	**re units** Correct answer scores both marks	**1**

Question			Mark	Acceptable answers	Notes	Total
8	**b**	**ii**	M1	0.05 / answer to (b)(i)	**re units**	**1**

Question			Mark	Acceptable answers	Notes	Total
8	**b**	**iii**	M1	136	~~**ore units**~~	**1**

Question			Mark	Acceptable answers	Notes	Total
8	**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**

PAPER TOTAL 90 MARKS