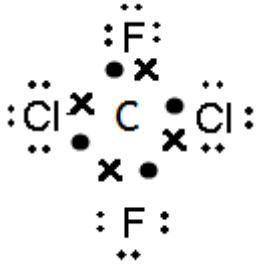
<table>
<tr><th>Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>1 a</td><td>C (green)</td><td></td><td>1</td></tr>
<tr><td>b</td><td>value in range 120 - 250</td><td>If range given, it must be wholly within 120 - 250</td><td>1</td></tr>
<tr><td>c</td><td>(colour) dark(er) grey / black

(state) solid</td><td>Do not accept grey alone
Reject any other colour given with black eg blue/black
Ignore just darker than iodine

Accept correct state symbol</td><td>2</td></tr>
<tr><td>d</td><td>C (outer electrons)</td><td></td><td>1</td></tr>
<tr><td>e</td><td><table><tr><th>Incorrect word</th><th>Correct word</th></tr><tr><td>positive</td><td>negative</td></tr><tr><td>potassium</td><td>sodium</td></tr><tr><td>reducing</td><td>oxidising</td></tr></table></td><td>one mark for each correct row

Accept minor variations and alternatives and extra words
eg for negative, accept negatively / minus
eg for oxidising, accept oxidation / electron acceptor /oxidating
Accept potassium bromide and sodium bromide
Accept K for potassium and Na for sodium</td><td>3</td></tr>
</table>

Question number	Answer	Notes	Marks
2 a	M1 C (Bromine has a darker colour than air) M2 D (Bromine vapour diffuses upwards)		2
b i	C		1
ii	M1 ammonia (particles/molecules) travels/diffuses faster / further in same time (than hydrogen chloride) M2 (because of) lower M_r	Do not penalise ammonia atoms / ammonium (ions) / ammonia solution in place of ammonia If incorrect choice in (i), then no marks in (ii) If no answer in (i), mark on If C appears in (ii), mark can be awarded in (i) Accept smaller/lighter / ammonia less dense Reject ammonia molecules etc less dense Ignore references to kinetic energy Accept reverse argument for hydrogen chloride / hydrochloric acid for both M1 and M2	2
			Total 5 marks

Question number	Answer	Accept	Reject	Marks
3 (a) (i)	**M1** – divide all the masses by respective A_r **M2** – to give 0.02 : 0.02 : 0.04 **M3** – (mole) ratio is 1 : 1 : 2 Correct ratio or empirical formula with no working scores 0/3		division by atomic number/division upside down for all marks	1 1 1
(ii)	**M1** – 204 ÷ 102 = 2 OR 102 x 2 = 204 **M2** – $C_2F_2Cl_4$ Correct answer with no working scores 2 marks	(2 x 12) + (2 x 19) + (4 x 35.5) = 204 symbols in any order	 Fl for F	1 1
(b)	 **M1** – all four bonding pairs correct **M2** – rest of diagram correct **M2** dep on **M1**	Fl for F any combination of dots and crosses		2

	IGNORE inner shell electrons even if incorrect Award 1 mark for similar molecules, eg CCl_4 and CF_4			

(Total marks for Question 3 = 7 marks)

Question number			Answer	Notes	Marks
4	a		bromine: (red-)brown fluorine: gas AND astatine: solid	Accept red Reject orange / yellow	1 1
	b	i	Mg^{2+} Cl^-	Accept H^+ / H_3O^+ Ignore OH^- Award 1 for both ions correct but in wrong order	1 1
		ii	hydrogen / H_2 burns with a pop / squeak OR use burning/lit splint/flame to see if pop/squeak	Ignore H Must be reference to test and result Reference to splint/match with no indication of flame is not enough Reject reference to glowing splint Ignore flame extinguished 'Squeaky pop test' alone is not sufficient No ECF from wrong gas M2 DEP on M1 correct or missing	1 1
		iii	white precipitate silver chloride to prevent other precipitates forming	Accept white solid / ppt / ppte / suspension Accept AgCl Accept to react with carbonate (ions) Accept to react with hydroxide (ions) Accept carbonates/hydroxides (also) form (white) precipitates	1 1 1

Question number			Answer	Notes	Marks
	b	iv	hydrogen chloride/HCl does not dissociate / does not <u>form/produce</u> ions OR hydrochloric acid is not formed (in methylbenzene) /HCl is not an acid (in methylbenzene) / no H^+ ions (present/formed) OR only dissociates/forms H^+ ions in water	Accept hydrogen chloride covalent bonds do not break Ignore there is no water Ignore there are no ions (unspecifiied) Ignore all references to not reacting with methylbenzene	1

(Total for Question 4 = 10 marks)

Question number	Answer	Notes	Marks
5 (a) i	gas / (g) / g	Accept equivalents such as gaseous / vapour Ignore colours	1
ii	darker / dark grey	Accept black Ignore references to states Ignore more intense Reject reference to any other colours	1

Question number	Answer	Notes	Marks
5 (b) i	no reaction (possible) / no displacement OR halogens do not react with their own halide ions	Accept no change Ignore references to lithium chloride containing chlorine / already reacted / OWTTE	1
ii	iodine/it is less reactive than bromine / bromine more reactive than iodine	Accept correct references to positions in (re)activity series Both halogens must be mentioned, except assume it refers to iodine Reject –ide endings Accept symbols and formulae Ignore references to only one element, e.g. iodine is unreactive Reject any comparison involving sodium	1
iii	iodine	Ignore references to states Ignore I and I_2	1
iv	cross in box D (bromine displaces iodine)		1
v	2KCl + Br_2	Either order Penalise incorrect symbols/numbers / unconventional formulae in this part, e.g. CL, br, Br^2, ClK	1
		Total	**7**